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E. E. Mote, of San Francisco, manager of the Pacific Car Service Bureau, has issued a circular showing the results of charging six dollars a day demurrage on freight cars not promptly unloaded by consignees—which has been required by law on intrastate freight in California since the first of July. In the first month the average detention was reduced to 3.58 days per car, whereas on interstate shipments, to which the one-dollar rate still applies, the average detention was 5.91 days.

Of the 93,965 cars reported by California agencies, 75,654 or 80.51 per cent. were subject to the rate of $6 per day. Of the 75,654 cars subject to the $6 rate, 916 or 1.21 per cent. were held beyond the free time, while of the 18,311 cars subject to the $1 rate, 1,136 or 6.20 per cent. were held beyond the free time; $8,692 demurrage at the rate of $6 per day accrued on 916 cars, the total detention of which was 3,279 work days or an average of 3.58 days per car.

The sum of $4,439 demurrage at the rate of $1 per day accrued on 1,136 cars, the total detention of which was 6,714 work days or an average of 5.91 days per car. Assuming that the $6 rate if applied to interstate traffic would have released the same proportion of cars as of intrastate traffic, the number of interstate cars held overtime would have been 222 cars instead of 1,136, the total detention would have been 795 days instead of 6,714, or a saving of 5,919 work days. In territory outside of California on 10,536 cars, all subject to the $1 rate, 5.59 per cent. were held overtime, the detention being an average per car of 6.06 working days, or 2½ days longer per car than on those held overtime at the $6 rate. Mr. Mote says: "With but a single month's practical application of the $6 rate it may yet be too soon to speak with certainty as to its adaptability and fairness to the public in all circumstances and conditions, but from reliable information received from officials, agents, bureau inspectors and shippers, the results appear to have been generally satisfactory to the carriers and to that portion of the shipping public regulating shipments to correspond with unloading facilities and those who do not seek profits in the marketing of goods from the car. There has also been apparent an exercise of greater care on the part of shippers in ordering cars for loading by specifying the date they are wanted and an avoidance of the old practice of ordering in advance of the time and in excess of the number wanted. Terminals have been cleared of old loads, reducing the expense of and adding to the efficiency of switching service. The value of a car has been increased six fold in the mind of every railway employe and with every shipper or consignee responsible for the penalty for negligence, which is a noticeable benefit."

THE BLACKWELL'S ISLAND BRIDGE.

The superstructure of the Blackwell's Island, or Queensboro bridge, the most northerly structure connecting New York and Long Island, was fabricated and erected by the Pennsylvania Steel Co. In view of the criticisms of this structure, the Pennsylvania Steel Co. instructed its chief engineer, F. C. Kunz, to submit an elaborate report on the calculations and strength of the superstructure and requested a commission, consisting of Charles Macdonald, C. C. Schneider, H. R. Leonard and J. E. Greimer, to pass upon such report. The report of Mr. Kunz and findings of the commission together with extracts from reports of experts, extracts from specifications, plans of the structure, diagrams of loads and tables of stresses have been published in a pamphlet by the company.

It is unnecessary to gratify the commission, but it may be well to recall that Messrs. Macdonald and Schneider are past presidents of the American Society of Civil Engineers, the former for many years partner in the Union Bridge Company and American Bridge Company, and identified with many of the most important bridge structures in the world; the latter an eminent consulting engineer and chief and consulting engineer of the American Bridge Co. Messrs. Leonard and Greimer have been identified as bridge engineers with the Pennsylvania and Baltimore & Ohio railways, respectively.

The report is not defensive; it is coldly judicial; nevertheless all investigations have agreed in commending the quality of material and character of workmanship of the contractors. The commission's object has been to put before the engineering profession a full knowledge of the situation and to assure the public of the safety of this structure.

The Pennsylvania Steel Co., in November, 1903, contracted to furnish the steel superstructure in accordance with plans and specifications of the Department of Bridges of the city of New York of which Gustav Lindenthal was then commissioner. About a year later the city made numerous changes which increased the dead load by adding two elevated railway tracks, bracing, secondary verticals, etc., a total weight of about 11,000,000 lbs., part of which, however, did not affect the trusses. Subsequently plans for the paving were changed, increasing its area, the thickness of concrete, the depth and weight of rails and heavy cast-iron curbs. The contract of the Pennsylvania Steel Company was completed in June, 1908, and the work accepted by the Department of Bridges. In the spring of that year and several months after the failure

of the Quebec bridge, one of the New York daily papers published criticisms of the design of the Queensboro bridge. On June 9 the commissioner of bridges called upon Professor William H. Burr and Messrs. Boller and Hodge to "examine and report upon the design and structure" of the bridge. These reports agree in commending the material and workmanship of the contractor; they testify to the full sections required by the unit stresses and approved working plans and to the agreement of shipping weights with estimated weights; they approve the design of the floors, but they disapprove of the design of the trusses on the ground that the stresses are higher then permitted in the specifications. Professor Burr adds they are "higher than prudent to permit, although practically not in excess of the limits approved by the commission of expert engineers in 1903." Messrs. Boller and Hodge say: "Eighth—That the main trusses will not carry all the specified live loads for which the structure is designed." The reports agree in recommending the reduction and rearrangement of dead loads, including the removal of the two upper railway tracks and regulation of traffic.

The specifications read, "The bridge shall be proportioned to carry in addition to its own weight and that of the floor a live load either uniform or concentrated or both, as specified below, placed so as to give the greatest stress in each part of the structure."

For the main members of the trusses and towers:

(a) A load of 8,000 lbs. per lineal foot of bridge as "regular," or

(b) 16,000 lbs. per lineal foot of bridge as "congested" traffic.

For the secondary members of the trusses, the floor beams and the floor system; elevated track, 52 tons; street car track, 26 tons, or a load of 1,800 lbs. per lineal foot of track; roadway, 24 tons for area 12 ft. x 30 ft., and remaining portion, 100 lbs. per sq. ft., and for footwalk, 100 lbs. per sq. ft.

"The wind pressure shall be assumed as a moving load acting in either direction horizontally with 2,000 lbs. per lineal foot."

The report of the commission of the Pennsylvania Steel Company calls attention to the importance of the questions involved and the unfortunate remark of the Royal Commission investigating the failure of the Quebec bridge to the effect that "under extreme conditions the Quebec bridge stresses are in general harmony with those permitted in the Blackwell's Island Bridge." It makes a strong appeal to common sense rather than technicalities and recites that this structure in particular is a highway and carries traffic rather than theoretical pounds per lineal foot and that the assumptions as to live loads are more than usually a matter of judgment. It shows the dead load with four elevated tracks as proposed eventually, but with a reduction of paving, etc., to be about 130,700,000 lbs. as against an assumed (1904) weight of about 122,130,000 lbs., an increase of 6½ per cent., and the steel now in place, plus an additional amount required to complete the overhanging sidewalks, as 106,650,000 lbs. as compared with 103,100,000 assumed in 1904, an increase of 3½ per cent. It argues against the propriety of the assumption by the experts of a "congested" load of 16,000 lbs. per lineal foot in certain fixed portions of the bridge with fixed lengths of gaps without load, and assuming Professor Burr's method of distribution of train load on four elevated railway tracks by spacing eight-car trains in position to give maximum stress but not less than 1,000 ft. apart, and allowing additional 8,000 lbs. per lineal foot, it finds that the stresses produced practically agree with those specified for the congested load and they are therefore well within the limits of safety.

The conclusions are: "(1) We are of the opinion that the live loads provided for in the original specifications, with the subsequent modifications made by the Bridge Department, both as to weights and distribution of same, are sufficient for the traffic the bridge is intended to carry and cover all possible contingencies.

"(2) That the unit working stresses specified are in accordance with good practice, and the limiting stresses for extreme conditions of loading are well within safe limits.

"(3) That the actual weight of steel superstructure practically agrees with the estimated weight used in calculating the stresses, within the usual allowance permitted in bridge work.

"(4) That the superstructure, as built, conforms to the specifications and designs approved by the Bridge Department.

"(5) That the bridge, as now constructed, with provision for two elevated tracks, is entirely safe to carry all traffic which can possibly come upon it under present conditions, without any other restrictions than those necessary to regulate such traffic.

"(6) That, for conditions of traffic, i.e., the weight of vehicles, surface and elevated cars, as now existing, the bridge would be also safe to carry all lines of traffic contemplated in the final design of the bridge subject to ordinary traffic regulations."

It is difficult for a layman, and even for an engineer who is not a bridge expert, to follow the maze of loads, theory of design, limits of safety, etc., as discussed in the several reports. The crux of the matter is: has there been error such as reflects seriously upon the skill of American engineers, and is the structure safe for the loads to which it will be subjected?

The changes made in roadway plans, increasing the weight of pavement, trolley rails, etc., to the extent of 1,859 lbs. per lineal foot, less a subsequent reduction of 1,168 lbs., was ill-advised and criticisms of the structure to this extent were fully warranted.

The matter of live loads is one of judgment. The structure has two floors; the lower carries a roadway between trusses, which are 60 ft. centers, and a trolley track inside and one outside each truss on brackets; the upper floor carries two elevated railway tracks in the middle, spaced 20 ft. centers, and two sidewalks outside. It is designed to move the sidewalks outside of the trusses on brackets, to be added, and place two more elevated railway tracks on track stringers now in place. The design of the trusses is a continuous cantilever (without suspended span), whereby a load on any portion of the structure affects the stresses in the structure from end to end. It can therefore readily be appreciated that while the loads on a single or double-track railway cantilever bridge can easily be placed to give maximum stresses, the assumption as to the placing and regulation of four kinds of live loads on this structure may open the way for a wide divergence of opinion. This structure is neither an auditorium nor a warehouse but a highway for moving traffic subject to regulation. It is unreasonable to assume heavy snow or wind loads with congested foot travel. In view of the movement of traffic in New York, it is difficult to conceive of trolley and elevated railway cars moving in both directions fully loaded or under similar conditions of congestion and grouping. It is doubtful if the roadway could intentionally be loaded with chosen moving vehicles or even that people could be induced to crowd with each other in discomfort to give the assumed congested loads. It is unreasonable that there should occur congestion of foot ways, roadway, trolley tracks and finally four elevated railway tracks, and inconceivable that these loads should be so grouped, with other portions of the structure unloaded, so as to give maximum stress. A less assumption as to the amount and arrangement of loads appears reasonable and the judgment and conclusions of the commission of the Pennsylvania Steel Company are apparently entitled to the confidence of the public and the engineering profession. The company has earned great respect by expending time and money, employing the Nestors and leaders in the profession, to make clear all that concerns the safety of this monumental structure.

PERSONAL LEADERSHIP IN RAILWAY EXPANSION.

During the last few weeks we have been witnessing in the world of railway and other stock prices a kind of fiscal apotheosis of a person and his pathology. Coincident with the refluent upward wave of prosperity a great railway magnate has been tossed on the cross waves and erratic currents of ill health. Hence great reflex action through the sensorium of "the street." Chills, fever, pallor and the pythian oracles of the doctors, actual or misreported, have vibrated in terms of price from Trinity church to the East river with their sub-thrills over the whole land. The thermometer of stocks has been the physician's test tube of pulse and temperature on a far-away continent or the home-bound trans-Atlantic liner. Speculation has raced up or down and bull or bear has been atop according as the physical rumor has been benign or sinister. It has been said, not altogether in metaphor, that on the eve of a big football match, if a crack player sprains a tendon his whole university goes lame. The railway mart with its immense volume of securities representing a vast concrete industry, on its higher scale of interests has come to repeat the same emotion. The body financial has entered into closer relations with an individuality and absorbed its nerves and muscles. Restated, with the last few weeks used as a practical and extreme illustration, the element of personal leadership in railway control, expansion and centrality is looming large. It has had, of course, its humorous and satirical side for the word-play of the newspaper wits. But below the froth is the substance of important things.

It brings home, for one fact, a new stage of railway consolidation differing from the old, however, in degree rather than in form or kind. The period of swift absorption of the small railway has become reduced to low terms. Here and there and at intervals there is report of the little railway line bought in or merged with the big system. But the main relation is one among the big railway systems themselves with their co-ordinate and normal problems of rates, harmony and co-working, and extensions, with the possible, often probable, ultimate of combination of one big system with another. It is not an epoch of taking in branch lines but of monopolies in large regions, like New England, or the fusing of great roads into a trans-continental system. This new and large epoch obviously involves great transfers of capital and bigger, if not more acute, companionship of the railway and banking; and another of its logical products, the direct result of centripetal forces, is the single-headedness incarnated in the so-called railway magnate. The principle is working out on lesser planes and in other shapes of business than the railways. In civics also we find it even more vivid. In municipal government, for an example, we see it developing in the movement for the centralized "commission" plan, for the "short" ticket at elections and for mayors with much enlarged if not autocratic powers. The tendency recognizes and registers the idea of efficiency embodied in a personal leadership, itself resting on two elements—brain work and responsibility.

The final product is and will long be the railway field marshal—he may also be called the railway architect—who in the most potent sense sits "at the head of the table" of boards of directors, who often sits there in effect whether there in body or not, who exercises, as well as symbolizes, personal leadership and who finally shows himself such a master of railway combination that even his bodily condition is a matter of broad and deep financial import. He has also his profound responsibilities. Like the scriptural tree he must and will be judged by his fruits. His credentials of real success are those in some respects of the humblest worker—whether he has up-built or torn down, whether he has added or subtracted from the sum of human wealth or human service—these rather than whether he has or has not accumulated personal riches. He may enjoy the prominence that makes him the object of public gaze, that sets him before the footlights, that makes his frown or his smile an elemental power in the stock market. But he enjoys these only at the cost of becoming also a target of criticism; and beyond lies the favorable or unfavorable verdict of just men on his personal leadership when his work is done. To some personal leaders in the railway development of the land such a verdict may not matter; to others it is everything; in the case of all it is almost the supreme test in which the moral result combines with the material. Partly by processes but much more by its finalities will the great personal leaderships in railway affairs be judged.

Barring the remote chances of state ownership and inferred from present conditions, personal leadership in our railway development seems bound to increase. With great systems almost sure to be merged in systems still greater, with railway finance reaching increased magnitudes and railway interests calling for centralized management, that form of management, converged in a single brain, seems likely to wax rather than wane. There will be fewer leaderships but they will probably be bigger. Against the perils of such future leadership, too personal, too autocratic or too selfish and with, perhaps, some unpleasant realities of "high" finance, optimism will set the stronger spirit of criticism which tends to grow as leadership itself expands. We have seen, in practice, with few exceptions, the industrial monopolies grow more and more responsive to the "monopoly" cry and to the fear that it will transmute itself into legislation. Bad railway leadership will open itself to the same check. If to it are joined such restraints as publicity and the acceptance by railway shareholders of their own responsibilities, all the better.

EIGHT HOURS' WORK AND EIGHT HOURS' PLAY—A DEFECTIVE THEORY.

M. C. Keefe, an inspector for the Interstate Commerce Commission, who has lately visited a large number of railway telegraph offices west of the Missouri river (as well as many in the East and South), finds that many operators who work eight hours a day appear to be utterly unable to make use of the surplus time that hangs heavy on their hands. They seem to have neither the ambition to study nor the ingenuity to entertain themselves. The impression made on Mr. Keefe's mind is that the law which has reduced these men's working day from twelve or ten hours to eight has thrown upon them a responsibility for the proper use of two, three or four hours a day which, as a class, they have not taken up. If the railway companies or the operators' brotherhood, or any power, would show these aimless young men how to use their time profitably the result would be a great blessing to the men and to society. The brotherhood, in securing the passage of the Federal law, only gave the operators the opportunity for self improvement; it has not shown them how to embrace it, and individual members may be worse off now than when they were confined to their offices 12 hours a day. Being young enough not to suffer seriously in health from 12 hours' indoor work, they were benefited by being kept out of mischief. In this the operators are not different from the majority of people. Most of us are benefited when we are restrained from carrying out the fancies of our idle hours. Many a carpenter, bricklayer or other workman who has had his working hours reduced by the power of a labor union has, no doubt, wasted the saved time utterly; but as a class the telegraphers are in more danger than artisans because they are so much younger. Married men are not so likely to cultivate laziness.

Why should not any large railway take the initiative in finding occupation for these idle hands and minds? The problem cannot be settled, like that of the idle trainman, by the easy process of giving a check for a few hundred or thousand dollars to the Young Men's Christian Association, but the job is at least equally well worth doing.

Mr. Keefe gives a picture of the present situation which will be recognized by railway men as true to life:

"The average railway telegrapher starts out with a pleasing personality, but unmindful of the need of education. He is quite likely to neglect his early opportunities in this respect. Often the operator's school days are ended before he reaches the eighth grade. If naturally bright, he becomes a first-class telegrapher, and by perseverance succeeds in getting as far as the despatcher's office; and in due time he is made despatcher. Up to this point, the need of education was not pressing, and he has filled his position as well as the man better equipped. But now the want asserts itself, for if further promotion is to be secured, the young man must be competent to participate in the management of the road. This is the case with numbers of young men who possess all necessary natural ability to make superintendents. It is a loss to the employing railway company that their powers are not developed. * * * But look at another picture: Many a young man enters the service able to read and write but poorly, and with no education. Realizing this condition the novice begins at once to remedy it, while working as telegrapher, and in a few years he has made up for the loss and neglect of school-boy days. It is not hard to find clergymen, physicians, lawyers and professional men in other fields who completed their studies while working as night operator at some lonely station; and this, too, when they were required to work 12 hours and more.

"Not one of the higher officers of to-day, who came up through the telegraph office to his present position of responsibility, that did not improve himself by study. This, however, was when the source of supply was the farms. Now it is the city boy. Twenty years ago the way station had its student who ran with messages and did chores for the privilege of learning telegraphy. At present one can travel day after day stopping at way stations and not encounter a student. * * * As a result of the agreement between the operators, a ban is put on the student; and with the universal abolition of the station student the telegraph school has sprung up and flourished. These schools are principally located in commercial centers. Boys from the country attending them are not long in acquiring the ways and habits of city life, and so it comes about that when the farmer's son returns to his way station he is entirely changed."

The problem is to change the "average" young telegrapher into an ambitious young telegrapher, bearing in mind that the task is probably more difficult than it would have been a generation ago, not only because of the greater influence of the city, but also because of the difference in native characteristics which have come about in our rural population during the last 25 years.

Probably a traveling promoter, going about like the "organizer" of a labor union, would be a necessary feature in starting any movement to induce young men to change from an easy to a strenuous life. "Going about," however, would be almost the only thing in which the study-promoter and the trades-union advocate would be alike. The latter offers great and immediate benefits for the small recompense of a yearly payment of very moderate dues; the educator would offer benefits more remote and only on even terms; the benefits would be no greater than the student was willing to work for. A traveling promoter would be necessary, or at least highly desirable, in order to insure as nearly as possible general participation and uniform progress, and to promptly clear away obstacles, real or imaginary. The correspondence-school idea is good as far as it goes, and indeed would be an essential feature; but emulation is a vital element in any general scheme of education and whatever might be necessary to insure this should be regarded as an essential.

To a telegraph operator in a small village or a lonely station the question what to study is almost as simple as the question of physical exercise for the hard-worked clerk in the general office: anything, faithfully attended to. The task of the organizer would be to direct the energetic and to show first steps to those not well enough informed to be fired with ambition. The young telegrapher should, of course, do his best to cultivate his mental powers, regardless of what his future is to be. This applies as well to women—even the woman whose chief aim may be to become the wife of some other operator. As a rule, however, efficiency in the railway service should be the goal. What we are now proposing is not in any sense antagonistic to the Southern Pacific training scheme described in our issue of June 4.* Rather it is a school preparatory to one of that kind. On the Southern Pacific lines there are doubtless several times as many eight-hour telegraphers as there are apprenticeships available for them, and the ambitious operator who is waiting for a vacancy in that higher school should improve the time in advancing himself so as to be able to learn the faster when he secures the favored place. If he never gets it his time will not have been wasted. The operator who gives himself a broad training will often stand a good chance in the traffic or accounting department; therefore he should not be discouraged if vacancies in the operating department come slowly.

We do not go into particulars, for curricula can be had ready-made, almost. Neither do we stop to ask who wants such a scheme; or what roads intend to follow the example set by Mr. Kruttschnitt. Are not both schemes desirable on all roads?

THE DIMINISHED PURCHASING POWER OF RAILWAY EARNINGS.

C. C. McCain, chairman of the Trunk Line Association, has written an interesting pamphlet entitled, "The Diminished Purchasing Power of Railway Earnings." He bases his case on the rate which a 15-ton carload of fourth-class freight carried all-rail between Chicago and New York would have borne during the year 1897 and during the year 1907. This rate remained unchanged at $105. He compares this fixed sum with the cost of the things that the railway and the community have to buy, and shows that there has been a substantial increase throughout the list. Some of the figures are very interesting. For example, station agents, who received an average daily wage of $1.73 in 1897 received an average of $2.05 in 1907, an increase of 18½ per cent., while trainmen's wages went up from $1.90 to $2.54, more than 33½ per cent. Stated another way, for this $105 which the carload of fourth-class freight receives, the railway could buy 60.7 days' labor from a station agent in 1897, but only 51.2 days' labor in 1907; or it could buy 51.2 days' labor of a fireman in 1897 as against 41.3 days' labor in 1907. To offset the increases in labor cost, Mr. McCain points out that an increase in railway rates of approximately 19.43 per cent. would be necessary.

Next to labor the principal single item of expense incurred in the operation of railways in this country is fuel, which constitutes about 11 per cent. of the cost of operation. In 1897, 119 tons of coal could have been bought for $105 in the state of Alabama, in 1907 only 81 tons; in Illinois 146 tons could have been had for $105 in 1897 as against 98 tons in 1907; in Pennsylvania 152 tons, as against 101 tons. In only one state in the Union—Oregon—was it possible to buy coal cheaper in 1907 than in 1897, owing to recent developments in that state.

Some of the increases in general supplies are even more striking. Axes of standard grade cost 39 cents each in 1897 and 68 cents each in 1907; Bessemer pig iron cost $10.13 a ton in 1897 and $22.84 a ton in 1907; pine doors cost 81 cents in 1897 and $1.88 in 1907; door knobs of a standard grade cost 16.6 cents a pair in 1897 and 45 cents a pair in 1907; lead pipe cost $4.32 a hundredweight in 1897 and $6.71 in 1907. The increases in taxation are equally striking. In 1897 183,284 miles of road paid an average tax of $235.36 a mile; in

*Since this article was written the Southern Pacific has issued a circular printed in our last issue, page 420, announcing an important extension of its educational department.—Editor.

1907, 227,455 miles of road paid an average tax of $353,09 per mile; an increase of just about 50 per cent.

It should be noted that Mr. McCain's figures are open to the objection that he took a year of exceptionally low prices in 1897; nevertheless, the conclusions reached are very nearly correct economically, as shown by the relative wholesale prices in 1907 as compared with the average of the decade from 1890 to and including 1899. Mr. McCain quotes the comparisons made by the United States Bureau of Labor, which takes the average price of a large number of commodities for this earlier decade, as equivalent to 100, and then quotes the per cent. price of the same commodities in 1907. Thus farm products, from the base of 100 in 1890-1899 had a value of 137.1 in 1907; cloth and clothing went from 100 to 126.7; fuel and lighting, from 100 to 135; metals and implements, from 100 to 143.4; lumber and building materials, from 100 to 146.9.

Meantime, in Group 1 of the railways of the country, embracing Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut, the average freight rate in mills per ton per mile decreased from 12.02 in 1897 to 11.45 in 1907; in Group 6, embracing the middle states, it decreased from 8.55 to 7.43, and for the whole United States it decreased from 7.98 to 7.59. Thus it is quite clear, regardless of the fact that 1897 was a year of exceptionally low prices, and 1907 a year of exceptionally high ones, that the tendency of freight rates has been downward and the tendency of labor and of all commodities has been upward, subject to remarkably few exceptions.

Mr. McCain's pamphlet does not carry as much weight as it otherwise would if he frankly mentioned the important fact that all these things can be true and yet that the railways can increase in prosperity, provided they do increasing amounts of gross business and are allowed to do it at a profit, even though this profit be a small one. The number of transactions, the number of cars moved or of tons carried, has a profound influence upon the prosperity of the railways, because fixed charges do not fluctuate proportionately to the amount of business done, and the maintenance charges do not follow it very closely. Consequently, in spite of the countless burdens which have been placed upon the railways during the last ten years, and in spite of the extreme difficulty with which any increases in freight rates can be brought about, even though all costs are higher, it is undeniable that the railways have gained much in prosperity, and this fact should be stated as clearly by their friends as by their hostile critics.

With this fact clearly stated and recognized, however, Mr. McCain's figures point the way to a very important and unavoidable conclusion: that in a continued upward drift of prices, the time must surely come when the freight rates of the present or of a decade ago, unchanged, will not bring the railway enough income to pay first costs and fixed charges from the business done with existing facilities. For a time in 1906 and 1907 it appeared as if this condition were actually at hand; costs were increasing abnormally, and net earnings were falling, in spite of the tremendous volume of business which was moving. At present, with a diminished volume of business moving, it is possible by close economy and skilled management for most railways to operate at a fair profit with existing rates; when the next period of traffic congestion and of scarcity of railway labor and consequent inefficiency and high prices arises, it is very doubtful if the actual profits will be as great as they are now.

The moral of Mr. McCain's figures is that the time is coming when freight rates will have to go up. This fact should be widely recognized and the reasons for it clearly understood.

NORFOLK & WESTERN.

The lessons learned by a compulsory cutting down of expenses in a time of severe business depression were taken full advantage of by the Norfolk & Western on the return of better conditions in the fiscal year ended June 30, 1909. Total operating revenue amounted to $29,300,000 in that year, as against $28,960,000 in the previous fiscal year. Expenses were $17,700,000 last year and $18,800,000 in the previous year. This reduced the operating ratio to 60 per cent., as against 65 per cent. in 1908. To make a strict comparison, however, it is necessary to substract from gross earnings this year $130,000 collected in the 1908 year but credited last year, and this sum should be added to the 1908 year. In 1908 the company by order of the court collected in passenger fares a maximum of 2½ cents a mile per passenger, but gave a coupon for a half-cent per mile with each ticket, and the sum collected above 2 cents per mile was held in reserve to pay this coupon if necessary. The Supreme Court of the United States has now decided that the company could not be compelled to charge a maximum of 2 cents per mile in Virginia, and the money on special deposit against the coupons has therefore been credited to pasenger earnings for this year, but was, in fact, earned in the previous year. Making the necessary adjustment the operating ratio last year was 60.72 per cent., as against 64.50 per cent. in the previous year.

The expenses in detail show that nearly the entire saving in expenses was in the cost of conducting transportation. This cost was $8,300,000 in 1909 and $9.300,000 in 1908. The saving of $1,000,000 was distributed quite evenly among the different accounts, both fuel and wages bearing about their proportionate reductions. The unit costs of maintenance in the two years were as follows:

	1909.	1908.
*Maintenance of way	$1,242	$1,289
Repairs, per locomotive	1,300	1,491
" " passenger car	523	615
" " freight car	53	55

*Per mile of first and second track, two miles of sidings and switch track being counted equal to one mile of main track.

As was mentioned in the review of the Chesapeake & Ohio's annual report in the *Railroad Age Gazette* last week, the competition for the soft coal traffic into the south Atlantic states is just now particularly keen. The Norfolk & Western during the year, jointly with the Atlantic Coast Line, formed an independent company called the Winston-Salem Southbound. Half of this company's capital stock is owned by the Norfolk & Western and half by the Atlantic Coast Line. It is to build a line from Winston-Salem on the Norfolk & Western south to Wadesboro, N. C., on the Atlantic Coast Line, about 90 miles. The line is be financed jointly, and it is estimated that it will cost about $3,000,000 to build. When completed it will be operated by the independent company in the joint interest of the Norfolk & Western and the Atlantic Coast Line. The advances made for construction will be paid back to the two railways by the issue of first mortgage 50-year 4 per cent. bonds. The Carolina, Clinchfield & Ohio is now nearing completion, and during the year a considerable additional mileage was put into operation. This line is controlled by the same interests that control the Clinchfield Coal Corporation, which has large coal mines north of the Blue Ridge mountains. It is estimated that on the completion of this line it will haul about 2,000,000 tons of coal a year. It has connection on the southeast with the Seaboard Air Line, and it also has close financial relations with this company. The building, therefore, of the Winston-Salem Southbound is probably both a move on the part of the Atlantic Coast Line in its competition with the Seaboard Air Line and, for the Norfolk & Western, a way of meeting competition of the Carolina, Clinchfield & Ohio.

The greater part of the coal traffic of the Norfolk & Western moves from the mines to the piers at Lambert's Point, about 346 miles. A low rate is undoubtedly charged on this coal, but owing to the fact that by far the greater part of the merchandise tonnage moves west, the utilization of cars that would otherwise run east empty is so great a saving that it seems quite possible that the most profitable part of the Norfolk & Western's business is carrying this low-grade tonnage to tide-

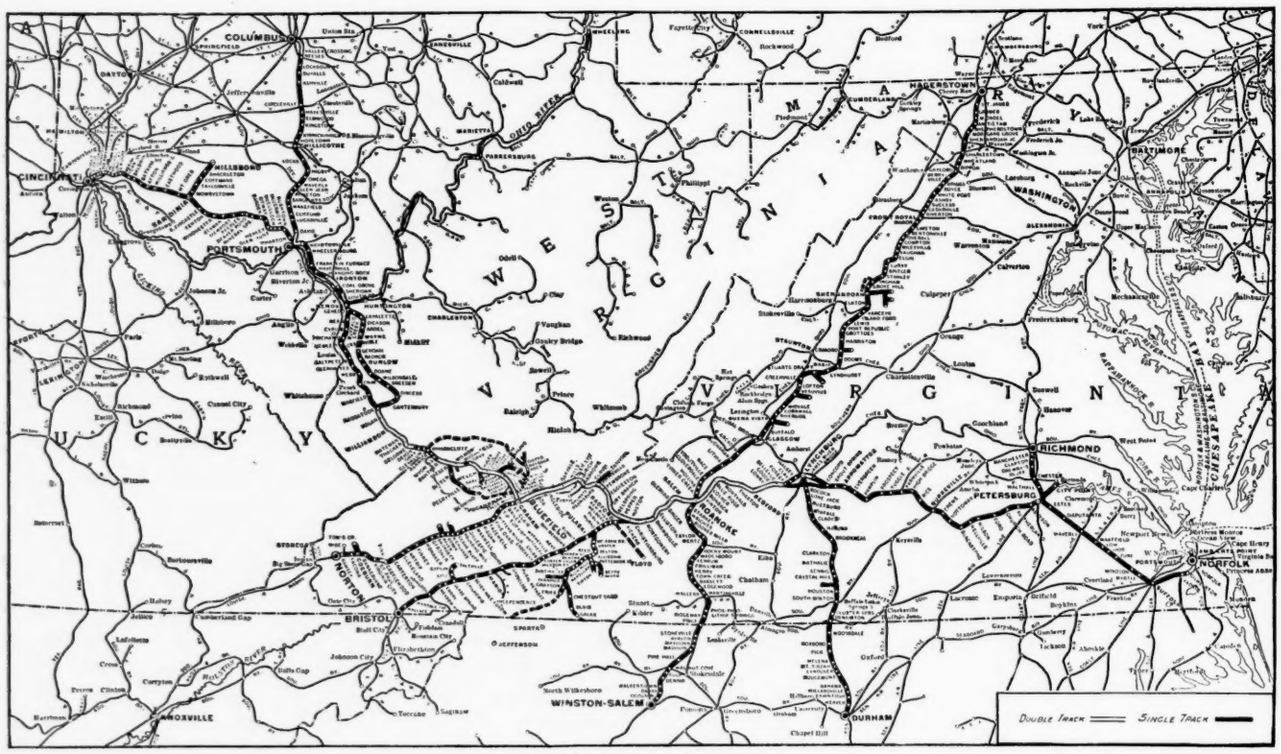
water. Last year the mileage of loaded freight cars moving north and east was 98,800,000 miles. This is very slightly less than the mileage in 1908. On the other hand, the loaded mileage south and west was 98,100,000 miles, an increase of 9,400,000 miles, or over 11 per cent., over the mileage in 1908. The empty mileage north and east totaled 60,500,000 in 1909 and 51,600,000 in 1908; in other words, there is a decrease of less than half of 1 per cent. in the loaded mileage east and an increase of 17 per cent. in the empty mileage. The empty mileage south and west was 63,000,000 in 1909, or almost exactly the same as in 1908; in other words, the loaded mileage increased by 11 per cent. west and remained the same for the traffic moving east. We might expect to find, therefore, that the tonnage of coal which moves east had remained about stationary, while the tonnage of merchandise which moves west considerably increased, but this is not the fact.

The total tonnage carried amounted to 20,000,000 tons last year, as against 18,600,000 tons in the previous year. This is an increase of about 1,400,000 tons. The tonnage of bituminous coal alone amounted to 10,960,000 tons in 1909, an increase of 1,300,000 tons. This almost equals the net increase in tonnage of all classes, and leads one to suppose that the Norfolk & Western has been developing a territory on the west to which it is shipping greater quantities of coal than formerly. In this western territory obviously such roads as the Carolina, Clinchfield & Ohio and the Virginian are at a disadvantage compared with the Norfolk & Western or the Chesapeake & Ohio. The total tons of freight carried, as we have said, increased, the increase being equal to about 7.7 per cent. The average distance each ton was carried was 268 miles, or just about the same as in 1908, while the average revenue per ton per mile decreased to 0.460 cents in 1909 from 0.481 cents in 1908. The average trainload, however, increased by nearly 8 per cent., being 616 tons in 1909. There were earnings per freight train mile of $2.85, as against $2.77 in 1908.

This increase in operating efficiency and resulting increase in net revenue is the effect of past heavy expenditures for improvement and betterment of both roadway and equipment. Since October, 1896, the company has spent for new lines and for betterment of property $63,900,000, of which $48,300,000 was charged to capital account and the remainder, $15,600,000, was charged to income. During the same time there were issued $18,500,000 equipment trust certificates, of which $6,600,000 were paid off previous to June 30, 1909. During the last few years work has been in progress on a number of portions of line where it is believed that the cost of second track will be more than offset by the gain in transportation facilities. After the work now authorized has been completed there will remain 64 miles of single track in Ohio and 21 miles in West Virginia, which the company thinks should be converted into double track as rapidly as possible. There was spent during the year $3,500,000 for construction, equipment and betterment, of which $1,500,000 was charged to capital and $2,000,000 to income under the head of betterments. The table at the end of this review shows $1,730,580 charged for betterments to income. There was, therefore, at the end of the year about $280,000 to the credit of betterment account that had not been expended during the year.

The company is in a strong position financially. It has arranged for the payment of the outstanding $6,386,000 5 per cent. collateral notes falling due in April, 1910, by the sale of $10,000,000 divisional first lien and general mortgage bonds. These bonds were deposited to secure the 5 per cent. notes, and of the proceeds of the bond sale some were used to buy notes in the hands of the public, and $6,386,000 was deposited in cash against the notes of like amount now outstanding. The rest of the money was used to reimburse the company in part for its capital expenditures. The balance sheet shows cash on hand of $7,600,000. This is an increase over the previous year of $1,800,000. In 1909 accounts payable amounted to $3,100,000, an increase of $1,300,000. There is a foot note which says the cash on hand on June 30, 1909, includes $4,000,000 of special deposit on interest bearing short term certificates, no such note appearing on the 1908 balance sheet, nor is this note apparently explained anywhere in the report.

During the year about $15,000,000 stock of the Norfolk & Western was transferred from Kuhn, Loeb & Co. to the Pennsylvania Railroad. In 1907 the Pennsylvania sold this stock to



The Norfolk & Western.

Kuhn, Loeb & Co., but the two transfers probably have no significance, as far as the management or policy of the Norfolk & Western is concerned, and they were merely a compliance in the first instance by the Pennsylvania with public opinion at that time.

The following table gives a comparison of the operation of the company in 1908 and 1909:

	1909.	1908.
Average mileage operated	1,925	1,881
Freight revenue	$24,710,591	$23,990,630
*Passenger revenue	3,512,382	4,106,937
Total operating revenue	29,197,647	29,091,672
Maintenance of way	3,331,888	3,384,709
Maintenance of equipment	4,919,435	4,910,242
Traffic	487,106	475,578
Transportation	8,346,992	9,324,276
Total operating expenses	17,729,756	18,764,714
Taxes	1,008,800	1,020,800
Operating income	10,459,091	9,306,158
Gross corporate income	11,440,203	10,227,122
Net income	6,535,978	5,849,571
Dividends	3,498,436	3,820,770
Additions and betterments	1,730,580	1,360,000

*This and all following figures are after the $129,455 collected in 1908 but credited in 1909 has been subtracted from the 1909 figures, as given in the annual report, and added to the 1908 figures as given.

AMERICAN LOCOMOTIVE COMPANY.

During a year of severe business depression the American Locomotive Co. has taken advantage of a smaller demand for its products to make improvements on its plants, and contracts have been made for work at Schenectady, Dunkirk, Pittsburgh and Richmond. The Rogers works are being rearranged and equipped for the manufacture solely of steam shovels, small contractors' locomotives and such products, and these products will no longer be manufactured at Richmond, Va., and Scranton, Pa.

The company is to spend about $3,500,000 on these improvements, and since the date of the annual report it has sold $5,000,000 5 per cent. notes and has thus put itself in a strong position financially. The balance sheet of June 30, 1909, shows cash on hand amounting to $4,672,042. This is just about the same amount as was shown for June 30, 1908, and it is only slightly less than total current liabilities, which were carried in 1909 at $4,489,254. This is as against total convertible assets of $15,602,556. The sale of the notes just at a time when business is beginning to rapidly improve will give the company an ample working capital, which, together with the economies that are expected to result from improvements, makes the outlook for the present year very much better than was the outlook a year ago at this time.

The manufacture of locomotives was one of the last businesses to feel the improvement in general business conditions, so that the earnings of the American Locomotive Co. in the fiscal year ended June 30, 1909, were the smallest in the history of the company. Gross earnings amounted to $18,008,634, as against $37,484,417 in 1908. Manufacturing and maintenance expenses were $17,665,962 last year and $32,497,627 in the previous year. This makes the operating ratio between 92 and 93 per cent. in 1909, as against an operating ratio of 86.7 per cent. in 1908. The report says:

"Orders were taken on small margin of profit in an effort to keep the plants running and preserve as far as possible the organization, so that the manufacturing operations would not suffer from disorganized and inexperienced forces on the restoration of business." Dividends of 7 per cent. were paid on the preferred stock, but no dividends were paid on the common stock. Five per cent. was paid on the common in 1908. After the payment of dividends the company carried a deficit of $762,861 to profit and loss. After the deduction of this deficit the company had a credit balance of $7,706,351 in profit and loss.

During the year the sale of automobiles was increased, and President Marshall says that the results in the operation of the automobile department have been so satisfactory as to warrant further increase in the capacity of the Providence factories, which has been accomplished largely by remodeling a number of adjacent buildings abandoned by the locomotive plant when it was shut down last year.

Contributed Papers.

THE TIMBER SUPPLY OF THE UNITED STATES.*

The original forests of the United States exceeded in the quantity and variety of their timber the forests of any other region of similar size on the globe. There were five great forest types: The Northern, Southern, Central, Rocky Mountain and Pacific Coast. Their boundaries are roughly sketched on the accompanying map.

The Northern forest ran from Maine through New England, across New York and most of Pennsylvania, through central and northern Michigan and Wisconsin to Minnesota, with an extension along the high Appalachian ridges as far southwestward as northern Georgia. Roughly it covered 150 million acres. In this forest the cone-bearing trees predominated. It was the home of the white pine, and associated with that tree were red pine, spruce, hemlock, cedar, balsam fir, birch, cherry, sugar maple and several other hardwoods of minor importance. The total stand of timber of all kinds in the Northern forest was originally not less than 1,000 billion board feet.

The northern extremity of the Southern type was in southern New Jersey. From there the forest widened out southward and westward through Virginia, and covered nearly all of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, portions of eastern Texas and Oklahoma, and southern and western Arkansas, with a small extension into southern Missouri. This, too, was a coniferous forest. The yellow pines predominated heavily. Interspersed with the pines in localities suitable for their growth were cypress, oak, gum, magnolia, yellow poplar and a variety of other hardwoods. The total original area of this forest was about 220 million acres, and it contained at least 1,000 billion feet of timber.

The Central forest stretched between the Northern and Southern types from the Atlantic coast to the Plains. There were no sharp demarcations between it and the others, and it was extremely irregular in shape. It was the only forest region of the United States in which the hardwoods predominated, and they grew in extreme abundance. Walnut, oak, elm, hickory, cottonwood, maple, basswood, chestnut, sycamore, red gum, ash and many other trees here reached their maximum development. It is conservatively estimated that the original area of the Central hardwood forest was not less than 280 million acres, and that the amount of timber standing in it before clearing began was at least 1,400 billion board feet.

The Rocky Mountain forest, as its name indicates, was typical of the Rocky Mountain region, from Idaho and Montana through Wyoming, Utah and Colorado to Arizona and New Mexico. It was separated by the Plains from the eastern forests and by desert areas from the Pacific forest. This forest grew chiefly on the higher plateaus and mountain slopes and was almost entirely coniferous. Western yellow pine occurred throughout, while lodgepole pine, Douglas fir, larch, spruce, western red cedar and other soft woods were abundant in many localities. The broken character of this forest makes an estimate of its area extremely difficult. It is probable, however, that the original extent was at least 110 million acres, with a stand of not less than 400 billion board feet of saw timber.

The Pacific type of forest prevailed in California, Oregon and Washington, reaching its maximum development along the Sierras and west of the Cascades. So far as saw timber was concerned, it was almost exclusively a coniferous forest,

*From Circular 166; Forest Service, U. S. Department of Agriculture.

and consisted chiefly of Douglas fir, western yellow pine, redwood, western red cedar, sugar pine and various other firs and spruces. The original area of this forest was at least 90 million acres, having not less than 1,400 billion ft. b. m. of timber.

TABLE 1.—*Estimate of the Area and Stand of the Original and Present Forests of the United States.*

Region.	Original forest		Present forest			
	Area, million acres.	Stand, billion ft.	Area, million acres.	Stand, billion ft.	Per ct. of original area.	Per ct. of original stand.
Northern	150	1,000	90	300	60	30
Southern	220	1,000	150	500	68	50
Central	280	1,400	130	300	46	21
Rocky Mountains	110	400	100	300	91	75
Pacific	90	1,400	80	1,100	89	79
Total	850	5,200	550	2,500	65	48

Table 2 gives the total land area of each state and estimates of the original and present forest acreage. This table is only tentative and mainly for discussion and correction.

TABLE 2.—*Estimate of Original and Present Forest Areas, Compared with Total Land Area, by States.*

State.	Land area, acres.	Forest area, Original—Extent, acres.	Original—Per cent. of land area.	Present—Extent, acres.	Present—Per ct. of land area.
Alabama	32,818,560	29,540,000	90	20,000,000	61
Arizona	72,857,600	14,570,000	20	14,000,000	19
Arkansas	33,616,000	31,940,000	95	24,200,000	72
California	99,898,880	29,970,000	30	24,000,000	24
Colorado	66,341,120	16,590,000	25	12,000,000	18
Connecticut	3,084,800	2,930,000	95	1,600,000	52
Delaware	1,257,600	1,130,000	90	350,000	28
Florida	35,111,040	29,840,000	85	20,000,000	57
Georgia	37,584,000	35,700,000	95	22,300,000	59
Idaho	53,618,560	24,130,000	45	20,000,000	37
Illinois	35,841,280	12,540,000	35	2,500,000	7
Indiana	22,966,400	19,520,000	85	4,000,000	17
Iowa	35,575,040	5,340,000	15	2,500,000	7
Kansas	52,335,360	1,570,000	3	1,000,000	2
Kentucky	25,715,840	23,140,000	90	10,000,000	39
Louisiana	29,061,760	26,160,000	90	16,500,000	57
Maine	19,132,800	18,180,000	95	14,900,000	78
Maryland	6,362,240	5,730,000	90	2,200,000	35
Massachusetts	5,144,960	4,630,000	90	2,000,000	39
Michigan	36,787,200	33,110,000	90	15,500,000	42
Minnesota	51,749,120	28,460,000	55	15,500,000	30
Mississippi	29,671,680	26,700,000	90	17,500,000	59
Missouri	43,985,280	26,390,000	60	18,300,000	42
Montana	93,296,640	23,320,000	25	18,000,000	19
Nebraska	49,157,120	1,470,000	3	800,000	2
Nevada	70,285,440	3,510,000	5	5,000,000	7
New Hampshire	5,779,840	5,490,000	95	3,500,000	61
New Jersey	4,808,960	4,330,000	90	2,000,000	42
New Mexico	78,401,930	15,680,000	20	12,000,000	15
New York	30,498,560	27,450,000	90	12,000,000	39
North Carolina	31,193,600	29,630,000	95	19,600,000	63
North Dakota	44,917,120	450,000	1	450,000	1
Ohio	26,073,600	23,470,000	90	4,800,000	18
Oklahoma	44,424,960	13,330,000	30	8,000,000	18
Oregon	61,188,480	30,590,000	50	27,000,000	44
Pennsylvania	28,692,480	27,260,000	95	9,200,000	32
Rhode Island	682,880	650,000	95	250,000	37
South Carolina	19,516,800	17,570,000	90	12,000,000	61
South Dakota	49,195,520	1,480,000	3	1,200,000	2
Tennessee	26,679,680	24,010,000	90	15,000,000	56
Texas	167,934,720	41,980,000	25	30,000,000	18
Utah	52,597,760	7,890,000	15	6,000,000	11
Vermont	5,839,360	5,550,000	95	2,500,000	43
Virginia	25,767,680	24,480,000	95	14,000,000	54
Washington	42,775,040	25,670,000	60	25,000,000	58
West Virginia	15,374,080	14,610,000	95	9,100,000	59
Wisconsin	35,363,840	26,520,000	75	16,000,000	45
Wyoming	62,460,160	12,490,000	20	10,000,000	16
Total	1,903,423,360	856,690,000	45	544,250,000	29

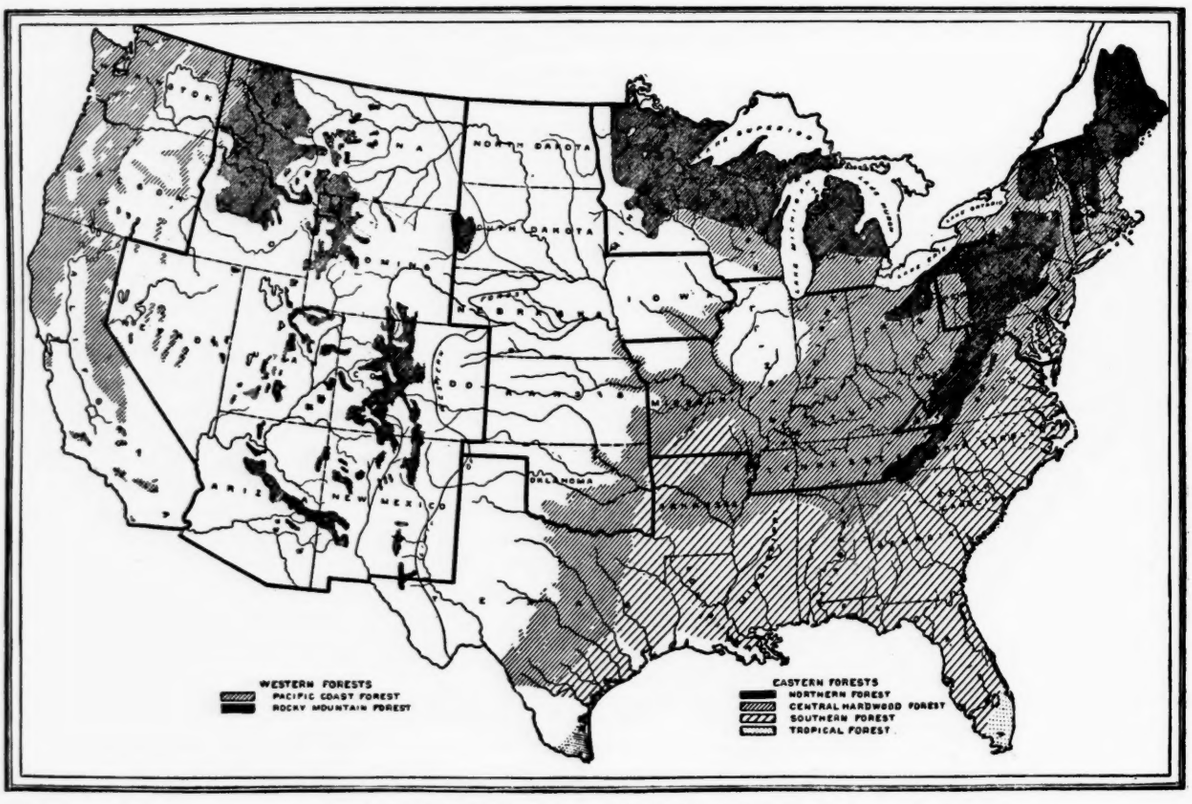
STUMPAGE ESTIMATES.

It is impossible with the data now at hand to make close estimates of the stumpage of the principal species, but Table 3 gives the best guesses that can be hazarded under the circumstances. Species are arranged in order of total stands.

TABLE 3.—*Stumpage Estimates.*

Species.	Billion board ft.	Species.	Billion board ft.
Douglas fir	525	Western spruce	60
Southern yellow pine	350	Eastern spruce	50
Western yellow pine	275	Western firs	50
Redwood	100	Sugar pine	30
Western hemlock	100	Cypress	20
Western cedar	100	Other conifers	100
Lodgepole pine	90	Hardwoods	500
White and Norway pine	75		
Eastern hemlock	75	Totals	2,500

Most of the forests in the United States are privately owned. Approximately 20 per cent. of the standing timber in the country is held by the federal government in national forests, Indian reservations, national parks and on the unreserved public domain, and by the states in state reserves or other state lands. These public forests contain more than 100 million acres of saw timber.



Location of Forests in the United States.

SERVICEABLE LIFE AND AVERAGE ANNUAL COST OF BRITISH LOCOMOTIVES.

The following diagrams are reproduced from a paper by Richard Price-Williams, published in the *Proceedings* of The Institution of Civil Engineers, London. They afford interesting comparative data for the American superintendent of motive power and locomotive builder.

According to the Board of Trade returns for 1906, there

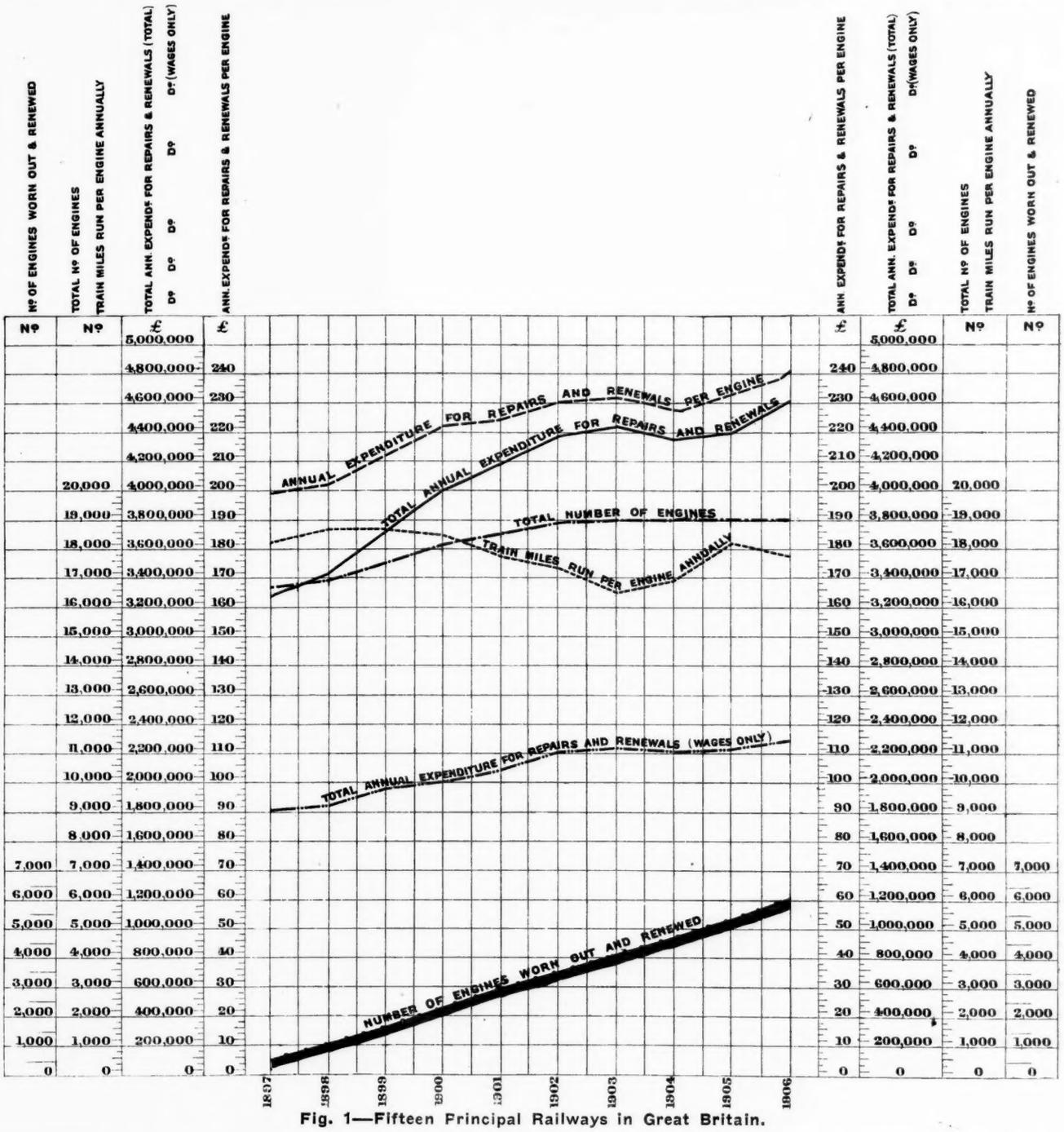

Nº OF ENGINES WORN OUT & RENEWED
TOTAL Nº OF ENGINES
TRAIN MILES RUN PER ENGINE ANNUALLY
TOTAL ANN. EXPENDS FOR REPAIRS & RENEWALS (TOTAL)
D° D° D° D° (WAGES ONLY)
ANN. EXPENDS FOR REPAIRS & RENEWALS PER ENGINE
ANNUAL EXPENDITURE FOR REPAIRS AND RENEWALS PER ENGINE
TOTAL ANNUAL EXPENDITURE FOR REPAIRS AND RENEWALS
TOTAL NUMBER OF ENGINES
TRAIN MILES RUN PER ENGINE ANNUALLY
TOTAL ANNUAL EXPENDITURE FOR REPAIRS AND RENEWALS (WAGES ONLY)
NUMBER OF ENGINES WORN OUT AND RENEWED
1897 1898 1899 1900 1901 1902 1903 1904 1905 1906

Fig. 1—Fifteen Principal Railways in Great Britain.

were 22,118 steam locomotives returned as being in serviceable condition for the conveyance of traffic on the 22,936 miles of line in the United Kingdom, which is almost equivalent to one engine per mile. In England and Wales there were 18,782 engines for 15,732 miles, which is at the rate of 1.11 engines per mile; while Scotland, with 3,841 miles of railway, had 2,455 engines, or .64 engine per mile; and Ireland had 880 engines for 3,363 miles of railway, or .26 engine per mile. In 1897 the total locomotive stock of the 15 railways taken consisted of 16,686 engines, varying in each type and tractive power; while the total expenditure during that year for their maintenance and renewal amounted to $16,510,000, the average expenditure per engine being approximately $989, and the average run per engine being 18,403 train miles. This total annual expenditure per engine increased rapidly and almost continuously during the next decade, and in 1906 reached a maximum of $23,240,000 in the aggregate, which works out at not quite $1,215 per engine. The total miles per engine, however, showed a very appreciable decrease. The total maintenance and renewal expenditure during the ten years amounted to approximately $205,420,000, and to an average of $1,119 per engine. This expenditure in the period of ten years (during which an addition of 2,444 new engines had been made to the stock, mainly out of capital for the equipment of the additional 1,203 miles of line opened in the interval) would have sufficed for

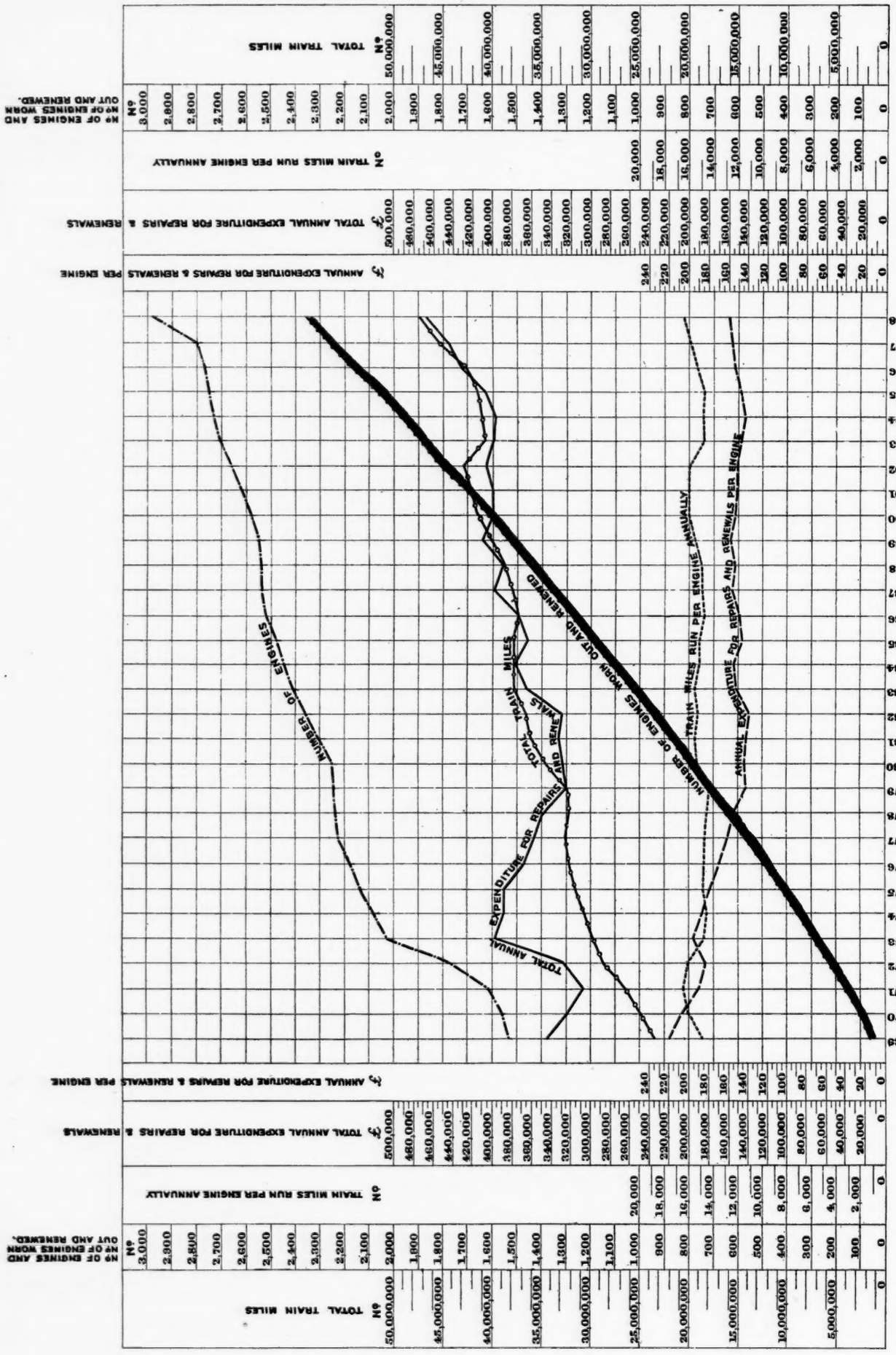


Fig. 2—London & North Western Railway.

the average cost of a new locomotive, which is around $12,500 in Great Britain, and have entirely renewed the stock of 16,433 locomotives of new and modern types; almost the exact number of the entire equipment of the 15 railways in 1897.

But the average serviceable life of a locomotive is much longer than ten years in Great Britain, being variously estimated at from 20 to 30 years. The author calculates that the annual expenditure for maintenance and renewal per engine is the equivalent of the annual death rate, so to speak, of the number of the worn-out engines of the locomotive stock of each railway, which in each year had reached the limit of their serviceable life, as measured by the aggregate amount of that year's expenditure per engine during a past serviceable life period of 30 years. Mr. Price-Williams points out that the large amount annually expended out of the revenue of a railway company in the maintenance and renewal of particular parts of the machinery of a large number of its locomotives in order to maintain the whole in a fit and serviceable condition for the conveyance of its traffic, of itself affords sufficient evidence that there can be no appreciable depreciation in their condition or value when by this constant renewal of the worn-out working parts of the machinery the entire stock is maintained in a serviceable condition, and that depreciation can only occur when the working parts have not been maintained in a proper and serviceable condition (Interstate Commerce Commission please take notice!—Editor).

The following tables supplement the statistical information shown on the diagrams. Where pounds sterling have been converted into dollars, the conversion has been at the rate of $5 to a pound:

Extract from F. W. Webb's Table, Covering Repairs and Renewals of Locomotive Stock on the London & Northwestern Railway During Years Selected as Typical. Dollars from Pounds at $5.

Year.	Number of engines.	Cost of repairs and renewals.	Per engine.	Per engine 30 yrs. to date.	Engines annually w'rn out and renewed.	Train mileage.	Train miles per engine.	Train miles per engine 30 yrs. to date.
1869	1,539	$1,728,310	$1,103	$33,690	51.30	23,279,660	15,127	453,810
1878	2,247	1,754,785	781	23,428	74.90	32,498,113	14,463	433,890
1888	2,547	1,961,985	770	23,110	84.90	38,641,005	15,171	455,130
1898	2,878	2,343,070	814	24,424	99.37	47,548,652	16,521	495,630

NOTE—Number of engines annually worn out and renewed is obtained by dividing column 3 by column 5

Summary of Locomotive Expenses on the Fifteen Railways Charted. Expressed in Dollars at $5 to the Pound.

Year.	Wages.	Materials.	Total.
1897	$9,021,515	$7,489,735	$16,511,250
1900	10,287,900	9,994,230	20,282,130
1903	11,277,320	11,054,520	22,331,840
1906	11,596,025	11,643,545	23,239,570

TRAIN RESISTANCE.

BY F. J. COLE,
Consulting Engineer, American Locomotive Co.

III.

TRAIN RESISTANCE.

"As the speed increases from 0 to possibly 30 miles per hour. the co-efficient of friction gets smaller, but from there on it has been found to increase again. The temperature has a similar effect. As it increases, this co-efficient gets less, until about 100 deg. F. are reached. Beyond this conditions change, and it is only natural that temperatures that are high enough to destroy the desired consistency of the oil will produce bad results."

("Train Resistance," A. Stucki, *Railway Gazette*, (London), May 21, 1909.)

Later on under another head will be found an abstract from a paper read by A. C. Dennis, in which he finds that the decreasing journal friction very nearly balances the resistance which increases with the speed, so much so that there is practically no increase in resistance per ton between 5 and 35 miles per hour.

TRACK RESISTANCE.

Upon the correct surfacing, alinement and stiffness of the track depends to a very great degree the elimination of useless oscillations and concussion, absorbing energy and from which no return can be obtained. "Lateral oscillation, especially the kind dampened by friction—as for instance that of vestibule cars—is an absorption of energy which goes to form part of the general resistance." Under this heading may be grouped low joints and irregular surface of the rails, either by kinking or lack of support. The items therefore chargeable broadly to track resistance are two, namely:

(a) Deflection of track, requiring the wheels to always run on a grade.

(b) Those which produce concussion and oscillations.

The track which would apparently give the lowest resistance values per ton consists of rails which are true on the surface little deflection under the moving load and in correct alignment horizontally and vertically. It would further appear that theoretically there should be little or no track play between the flanges on the wheels and the rails, as any slewing of the truck or vehicle in the track must result in energy being absorbed by flange action and the tendency at times of the axle to assume positions that are not perpendicular to the rails or in the constant shifting of the wheels from one side to the other. This flange action is assumed by Mr. Carus-Wilson to be a large proportion of the total resistance. Of course, practical conditions govern the amount of end play necessary on account of the impossibility of maintaining the track exactly to gage or in mounting wheels exactly to pre-determined distances, so that some amount of play is absolutely essential. It would appear, however, that the subject is one well worthy of investigation and that the tendency in the future would be towards less rather than more. When it is remembered that the rules of the Master Car Builders' Association permitted at one time a variation of ¾ in. in the mounting of wheels, that is from 53 in. between backs of flanges to 53¾ in., the necessity for a liberal amount of end play is at once apparent.

It is interesting to note in this connection, the significance attached to the stiffness of track by Dr. Dudley. Quoting from his pamphlet, "Condensed Diagrams of the Inspection of the N. Y. C. & H. R. R. R., 1899":

"The ability to draw eighty loaded 60,000 lbs. capacity cars in one train by the locomotive shows what has been accomplished in the way of reducing train resistance by improving the track, motive power and rolling stock. On the light 4½-in. 65-lb. rails the freight train resistance was 7 to 8 lbs. per ton, and is now reduced to 3½ lbs. on the 5⅛-in. 80-lb. rails for the 60,000 capacity cars and long trains. For 80,000 to 100,000-lb. capacity cars loaded it would be still less."

In the same report he gives the resistance of a freight train 3,300 ft. long on a 5⅛-in. 80-lb. rail at 20 miles per hour as 3½ lbs. per ton.

FLANGE ACTION.

It is probable that the average amount of energy attributable to flange action has been overestimated by Mr. Carus-Wilson. At times the maximum amount may be required, consistent with the conditions named, but for the greater part of the time during which the train is in motion it is probably but little or at most partial "slewing" or angular motion of the trucks to the rail that takes place. Expressed in another way: The maximum conditions only occur as a small percentage of the time and the average energy absorbed would be much less than determined by the expression $2.94\ V \frac{c}{b} \frac{w}{w}$ pounds per ton, in which V equals miles per hour, c flange play between wheels and rails, b wheel base of truck in feet, w total weight of car including trucks, in tons, W weight of two trucks in tons.

The exact flange play between wheels and rails is necessarily a somewhat indefinite amount, owing to the radii of rail head

and throat of wheel being different. With the American Society of Civil Engineers standard rail sections and Master Car Builders' Association chilled and steel tired wheel flanges and treads, the relative track play is shown in Fig. 4. The actual play unaccompanied by lifting is less than ⅛ in. on each side or about $\frac{3}{16}$ in. for chilled tread and ¼ in. total for steel tires. If the wheel is forced still nearer the rail, the ⅝-in. fillet at the throat will commence to mount the $\frac{5}{16}$-in. rail fillet, thus lifting the tread from the rail. This action is shown in the curve A B for chilled tread and C D for steel tire. Because of this, the wheels and rails are self-centering in their action, permitting but slight flange play without work being done in lifting the wheels and therefore having a tendency to return to the center where the lateral pressure is relieved.

In a greater or less degree these are the characteristics of the relations of American track to wheel flanges. The radius small amount of lateral play unaccompanied by lifting action, which is necessary to overcome the inaccuracies and inequalities of track and wheel mounting which are inseparable in practical railroading.

"Only a very small percentage of wheels ever get sharp flanges, and there are never two sharp flanges on one axle; showing that some mechanical defect of wheel or truck (usually the latter) is the chief cause of sharp flanges, and not some general cause acting upon all wheels alike." "Except in the one case of the outside rail on curves, rails invariably wear to a much smaller corner radius."

"What sound practice would seem to require, therefore, is: The tread of the wheel should have a fillet radius of at least ¾ of an inch instead of the ½-in. radius Mr. Forney recommended. The original corner radius of the rail should be little if any greater than the ¼ or $\frac{5}{16}$-in." (A. M. Wellington, *Railway Location*, page 308-309.)

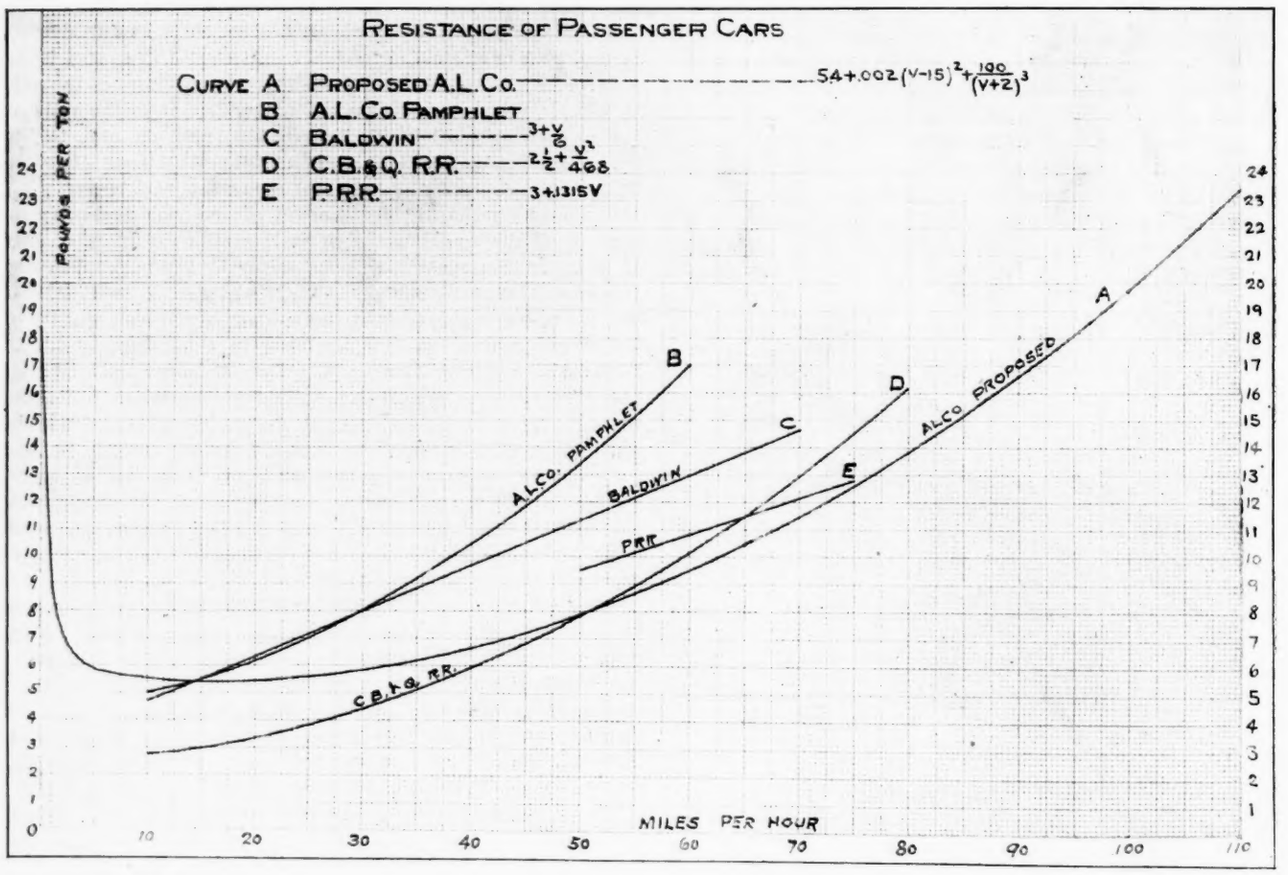


Fig. 6.

at the head of the rail is invariably smaller than at the throat of the flange, while the differences in track flange play unaccompanied by lifting may differ according to the shape of the rail head or the accuracy with which the gage is maintained or the wheels mounted upon the axles. The same general features are characteristic of track construction in this country, namely: that the total flange play is not obtained without some lifting action of the wheel treads upon the rails, and the amount unaccompanied by lifting action which permits inclination of the trucks in the track is a comparatively small percentage of the whole.

For these reasons, the excessive amounts of energy attributable to flange action by Mr. Carus-Wilson cannot be accepted until supported by more definite data. Furthermore, there is always a self-centering action tending to avoid the inclination of the truck to the track which causes the trucks to run with the rails and not at an inclination, except for a very

If a four or six-wheel truck had a constant tendency to turn to the right or left and always to take an angular position to the rail, the wear on the flanges of the forward wheels on four-wheel trucks would be much greater for vehicles as normally moved head on, such as leading, trailing and tender trucks of road locomotives, especially those in passenger service on roads having little or no curvature. On curves, the natural tendency is for the forward flange to press against the outer rail, the back axle to take a position radial to the curve. Because of this, there is more wear on the flanges of the forward wheels than the back.

It is difficult to obtain conclusive data on this subject from roads having large percentages of tangents and little curvature. What has been obtained indicates that the forward flange wear under these conditions of straight track is not excessive.

In the following table for an American freight car of 30

tons total weight of car and load at speeds of from 10 to 35 m.p.h. are shown the amounts in pounds per ton and the percentages of the total resistance worked out according to Mr. Carus-Wilson's formula, for the different elements as given:

Miles per hr.	Friction—Journal Lbs.	Friction—Journal Per ct.	Friction—Rolling Lbs.	Friction—Rolling Pr ct.	Flange action. Lbs.	Flange action. Pr ct.	Air resistance Lbs.	Air resistance Pr ct.	Total resistance.
10	1.98	63.0	0.133	4.2	0.92	29.3	0.11	3.5	3.14
15	1.98	52.7	0.133	3.5	1.39	37.0	0.25	6.7	3.75
20	1.98	45.0	0.133	3.0	1.85	42.0	0.45	10.0	4.41
25	1.98	38.9	0.133	2.6	2.31	45.0	0.69	13.5	5.11
30	1.98	33.7	0.133	2.3	2.77	47.0	1.00	17.0	5.88
35	1.98	29.5	0.133	2.0	3.23	48.5	1.36	20.0	6.70

The third element, however, track resistance, is omitted, because, for reasons before stated, he considers this negligible for speeds of 10 m.p.h. and over.

In the above table the clearance between the flange and rail is assumed to be ¾ in., the figures being given more in detail in table No. 1. According to this the flange action accounts for 29.3 per cent. at 10 m.p.h. and 48.5 per cent. at 35 m.p.h. In the equation no account is taken of the end play between the journals and bearings and other lost motion which goes to make up the total end play of the wheels and axles in relation to the track. It is apparent that considerable hunting of the wheels and axles from side to side may occur without occasioning any swiveling action of the trucks around the center pin. End play permits lateral movement of the wheel to the rail with but little expenditure of energy, because the path of the journal in the bearing is helical and no motion is imparted to the mass of the truck to revolve it around its center pin. Furthermore, the formula does not take into account the friction of the center plate or of the side bearings. It does not appear to have been definitely proved that the normal tendency of the trucks on a straight track is to continually hunt from one side to the other, causing the truck to move around in a circular path, except perhaps with sharply coned wheels. If this were admitted, it would mean that the forward flange on one side and the backward flange on the other side would be continually pressed against the rail. It is probable that flange action forms a part of the total resistance, but probably it is not nearly so high as given by Mr. Carus-Wilson, and that while the total results of train resistance at some of the speeds agree fairly well with actual tests, yet it would appear that the resistance between the limits of 10 and 35 m.p.h. is too low in the former and too high in the latter to be consistent with actual tonnage ratings.

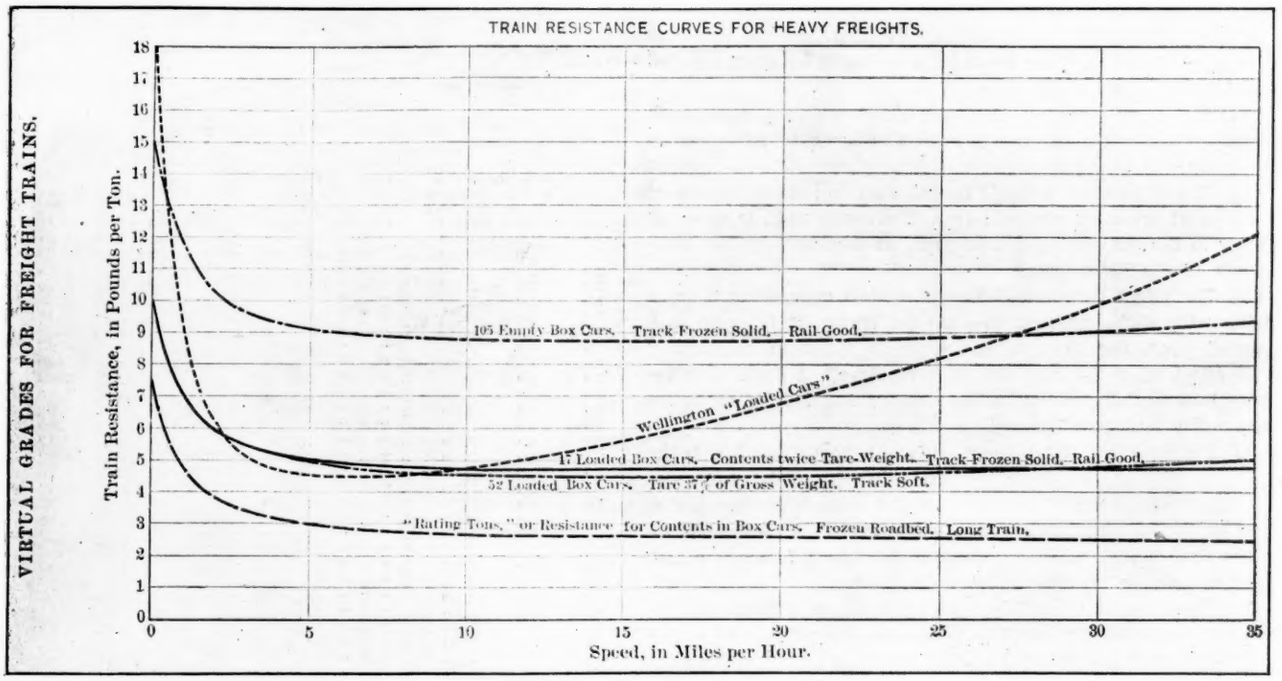

TRAIN RESISTANCE CURVES FOR HEAVY FREIGHTS.
VIRTUAL GRADES FOR FREIGHT TRAINS.
Train Resistance, in Pounds per Ton.
Speed, in Miles per Hour.
105 Empty Box Cars. Track Frozen Solid. Rail Good.
Wellington "Loaded Cars"
17 Loaded Box Cars. Contents twice Tare-Weight. Track Frozen Solid. Rail Good.
52 Loaded Box Cars. Tare 33⅓ of Gross Weight. Track Soft.
"Rating Tons," or Resistance for Contents in Box Cars. Frozen Roadbed. Long Train.

Fig. 7.

AIR RESISTANCE.

As before stated, for single units operated at high speeds, the shape of the forward end, and to a lesser degree the back end, is of great significance. For electric cars, with or without trailers—usually the latter, the values of head air resistance with different shaped ends has been very accurately determined.

The results of the Berlin-Zossen tests show on Fig. 3½ that a curve drawn through the points located from the observed pressures with the wedge or parabolic shaped end, follow very closely the equation $R = .0027V^2$, in which R equals pressure in pounds per square foot. Expressed in speed of kilometers per hour and pressure per kilograms per square meter, would be $.0052V^2$.

Louis Bell, in his introduction to the English translation of the Berlin-Zossen Electric Railway tests, states: "The value used by artillerists for projectiles at moderate velocity is .0051 when reduced to the same terms, so that the facts thus derived from two entirely different lines of experiment are in substantial agreement."

The same tests gave rise to the following formula in which P is the pressure on front end in pounds per square foot and V the velocity in miles per hour:

$$P = .00265V^2.$$

Assuming that the electric coach has 75 square feet sectional area, the following table shows the pressures:

Speed, mls. p. hr.	Total pressure, lbs.	Horse-power.
20	79.5	4.24
40	318.0	33.92
60	715.5	115.28
80	1,272.0	271.36
100	1,987.5	530.00

From the above it would appear that at speeds below 40 miles per hour the effect of head end resistance is of little importance. (*Railroad Gazette*, July 17, 1903, page 528.)

The effect of head winds is to increase the air pressure. They may be approximated by adding to the velocity of the train the velocity of the wind and using this figure instead of the speed of the train in determining the head air pressure. For example: If a train is running at 60 miles an hour and there is a head wind of 30 miles an hour, it is evident that the air pressure will equal 90 miles an hour. The most noticeable

effect of heavy winds on train resistance, however, are when they strike at an angle or quartering. The effect is that the broadside of the train presents a much greater surface to the action of the wind, and it is probable that a quartering wind striking the train at an angle of 45 deg. makes the maximum combination possible of air resistance, because in it are combined the effects of partial head air resistance and action of the wind upon the broadside of the train in forcing the flanges of the wheels against the opposite rails.

In practical tonnage ratings of the railways certain reductions in maximum tonnage for weather conditions are usually made, the normal or maximum amounts being computed for fair weather conditions. The following reductions in maximum tonnage have been suggested:

Temperature 45° and above,	no wind or light wind	100 per cent.
" 45° to 25°	heavy winds	92 "
" 25° to 0°		84 "
" 0° and below		75 "

The equation used by the General Electric Company for head air resistance is $R = .002V^2$, in which R equals the pressure per square foot of surface of round ended cars, and V the speed in miles per hour.

In his experiments on small models in a conduit Dr. Goss finds $R = .0012V^2$ for the head air resistance on square ended models. His conclusions are:

(1) The force with which the current will act upon each element of the train, or upon the train as a whole, increases as the square of velocity.

(2) The effect upon a single model, standing alone, measured in terms of pressure per unit area of cross-section, is approximately .5 the pressure per unit area, as disclosed by the indications of the Pitot gage.

(3) The effect upon the different models composing a train varies with different positions in the train; it is most pronounced upon the first model; next in order of magnitude is its effect upon the last model; next, its effect upon each intermediate model other than the second; and last of all is its effect upon the second model.

(4) The relative effect upon different portions of a train is approximately the same for all velocities. For example, any intermediate model, other than the second, always has a force to resist, which is approximately one-tenth that resisted by the first model, while the last model has a force to resist which is one-quarter that resisted by the first.

(5) The ratio of the effect upon each of the several models composing a train, measured in pressure per unit area of cross-section, compared with the pressure per unit area disclosed by the indications of the Pitot gage, is, approximately, for the first model of the train 0.4; for the last model of the train, 0.1; for any intermediate model between the second and last, 0.04, and for the second model, 0.032.

General results of air resistance tests from data given in report of Electric Railway Test Commission, St. Louis, are as follows (data extended to include speeds up to 100 m.h.p.):

Air Resistance in Pounds Per Sq. Ft., at Various Speeds.

Type of vestibule.	Miles per hour 20.	30.	40.	50.	60.	70.	80.	90.	100.
				Pressure.					
Parabolic wedge	0.39	0.48	0.74	1.37	2.10	2.98	4.00	5.20	6.60
Parabola	0.50	0.63	0.90	1.60	2.50	3.48	4.60	5.92	7.40
Flat	1.40	2.20	3.56	5.60	8.20	11.00	14.00	17.50	22.00
Standard	0.33	0.90	1.98	3.18	4.53	6.00	7.80	10.25	13.30
				Suction.					
Parabolic wedge	0.19	0.20	0.23	0.28	0.45	0.67	0.94	1.28	1.62
Parabola	0.08	0.09	0.11	0.15	0.24	0.32	0.42	0.53	0.65
Flat	0.14	0.17	0.20	0.37	0.50	0.65	0.85	1.15	1.45
Standard	0.13	0.22	0.40	0.70	1.04	1.43	1.85	2.30	3.78

The projected area of the front is 96 square feet.

It will be noted that the actual experimental data for the flat front vestibule did not exceed 50 miles per hour, and the reason for this is that it was impossible with the power at hand to force the flat ended car above this speed. This power was sufficient to easily permit a speed of 75 miles an hour with the parabolic wedge front vestibule, and this fact gives force to the statements already made.

The formula which closely corresponds at 40 to 100 miles, is: pressure in pounds per square foot of exposed flat surface equals $.0022V^2$.

From available data and experiments, the following in regard to air resistance may be deduced:

(a) That the air pressure increases as the square of the velocity.

(b) That the first locomotive or the first car of a train has to overcome a much greater resistance than any intermediate car, on account of the head end pressure.

(c) The shape of the forward end influences greatly the air pressure.

(d) That the advantages of shaped ends are much greater for single units operated at high speeds, than on trains composed of many cars.

(e) The smoothness of the sides, roof and shape of the space between the cars has considerable influence on air friction.

Table No. 1 gives the elements and totals of train resistance for American cars, estimated in accordance with formulae by Mr. Carus-Wilson. The wheels for all the cars are taken at 33 in. diameter. Clearance or play between wheels and rail ¾ in. The range of weight is between 20 to 72 tons, including loads, at speeds of 10 to 35 miles per hour.

Table I.—Resistance American Freight Cars, According to Formulas by Mr. Carus-Wilson.

Wheels, 33-in. diameter.

Speed miles per hour.	Total weight, car in tons.	Weight of 1 truck in tons (2,000)	Wheel-base of trucks.	Diameter of j'rnals.	Friction, per ton Journals.	Rolling.	Flange action.	Resistance Air.	Tot'l
10	20	3.00	5 ft. 0 in.	4¼x8	1.98	0.133	1.32	0.166	3.59
15	20	3.00	5 " 0 "	4¼x8	1.98	0.133	1.99	0.375	4.47
20	20	3.00	5 " 0 "	4¼x8	1.98	0.133	2.65	0.670	5.43
25	20	3.00	5 " 0 "	4¼x8	1.98	0.133	3.31	1.04	6.46
30	20	3.00	5 " 0 "	4¼x8	1.98	0.133	3.97	1.50	7.58
35	20	3.00	5 " 0 "	4¼x8	1.98	0.133	4.63	2.05	8.79
10	30	3.25	5 " 2 "	4¼x8	1.98	0.133	.92	.11	3.14
15	30	3.25	5 " 2 "	4¼x8	1.98	0.133	1.39	.25	3.75
20	30	3.25	5 " 2 "	4¼x8	1.98	0.133	1.85	.45	4.41
25	30	3.25	5 " 2 "	4¼x8	1.98	0.133	2.31	.69	5.11
30	30	3.25	5 " 2 "	4¼x8	1.98	0.133	2.77	1.00	5.88
35	30	3.25	5 " 2 "	4¼x8	1.98	0.133	3.23	1.36	6.70
10	40	3.50	5 " 3 "	5x9	2.33	0.133	.74	.083	3.28
15	40	3.50	5 " 3 "	5x9	2.33	0.133	1.10	.19	3.75
20	40	3.50	5 " 3 "	5x9	2.33	0.133	1.47	.33	4.26
25	40	3.50	5 " 3 "	5x9	2.33	0.133	1.84	.52	4.82
30	40	3.50	5 " 3 "	5x9	2.33	0.133	2.21	.75	5.42
35	40	3.50	5 " 3 "	5x9	2.33	0.133	2.57	1.02	6.05
10	50	3.75	5 " 4 "	5½x10	2.56	0.133	.621	.057	3.38
15	50	3.75	5 " 4 "	5½x10	2.56	0.133	.932	.15	3.78
20	50	3.75	5 " 4 "	5½x10	2.56	0.133	1.242	.27	4.21
25	50	3.75	5 " 4 "	5½x10	2.56	0.133	1.553	.42	4.67
30	50	3.75	5 " 4 "	5½x10	2.56	0.133	1.863	.60	5.16
35	50	3.75	5 " 4 "	5½x10	2.56	0.133	2.174	.82	5.69
10	60	4.00	5 " 6 "	5½x10	2.56	0.133	.535	.056	3.28
15	60	4.00	5 " 6 "	5½x10	2.56	0.133	.803	.125	3.62
20	60	4.00	5 " 6 "	5½x10	2.56	0.133	1.07	.22	3.98
25	60	4.00	5 " 6 "	5½x10	2.56	0.133	1.338	.35	4.38
30	60	4.00	5 " 6 "	5½x10	2.56	0.133	1.605	.50	4.80
35	60	4.00	5 " 6 "	5½x10	2.56	0.133	1.873	.68	5.25
10	72	4.25	5 " 6 "	5½x10	2.56	0.133	.473	.04	3.21
15	72	4.25	5 " 6 "	5½x10	2.56	0.133	.71	.14	3.54
20	72	4.25	5 " 6 "	5½x10	2.56	0.133	.946	.18	3.82
25	72	4.25	5 " 6 "	5½x10	2.56	0.133	1.183	.29	4.17
30	72	4.25	5 " 6 "	5½x10	2.56	0.133	1.419	.42	4.53
35	72	4.25	5 " 6 "	5½x10	2.56	0.133	1.656	.56	4.91

While in each group the resistance per ton at some speed is in substantial agreement with the figures used on the leading American railways, yet the most significant fact is the wide descrepancy between 10 and 35 miles per hour, especially the case with the light cars. This is also plotted in Fig. 3 in full lines, while in dotted lines the lowest figures obtainable from dynamometer tests on the P. R. R. are shown. In these latter tests the resistance is shown in Fig. 5 to be constant between 5 and 35 miles, or at least no higher at 35 miles an hour than at 5. The figures used by the C., B & Q. R. R. are also plotted in Fig. 5 on the dotted line, and is assumed to be correct for an average speed of 20 miles an hour. Elsewhere will be found in answer to Question No. 1, the replies of certain railway companies in regard to the relative resistance between the limits of 5 and 35 miles per hour.

An inspection of the figures given in table 1 and the curves on Fig. 3 shows the wide discrepancy between resistances given in the full curved lines of Carus-Wilson and the broken horizontal lines used by the Pennsylvania and other American

roads. The low resistance of the former at 10 m.p.h. and the rapid increase at higher speeds as compared with the latter (which are based on actual dynamometer records) is the principal criticism. Accounts of trains hauled on different roads are given elsewhere as a check on the American figures. The points of intersection of the curved and horizontal lines, where the figures agree on chart are:

Weight of car.	Speed at which lines and curves agree.	Weight of car.	Speed at which lines and curves agree.
20	31.0	50	16.0
30	28.6	60	11.6
40	22.5	72	6.0

Changes in weights and proportions of cars, or in wheel and rail clearance would make some difference in the above, but the cars selected represent fairly well current practice. With a change in wheel and rail clearance, the inclination of the curves would be the same only lower down and nearer the base line on the chart.

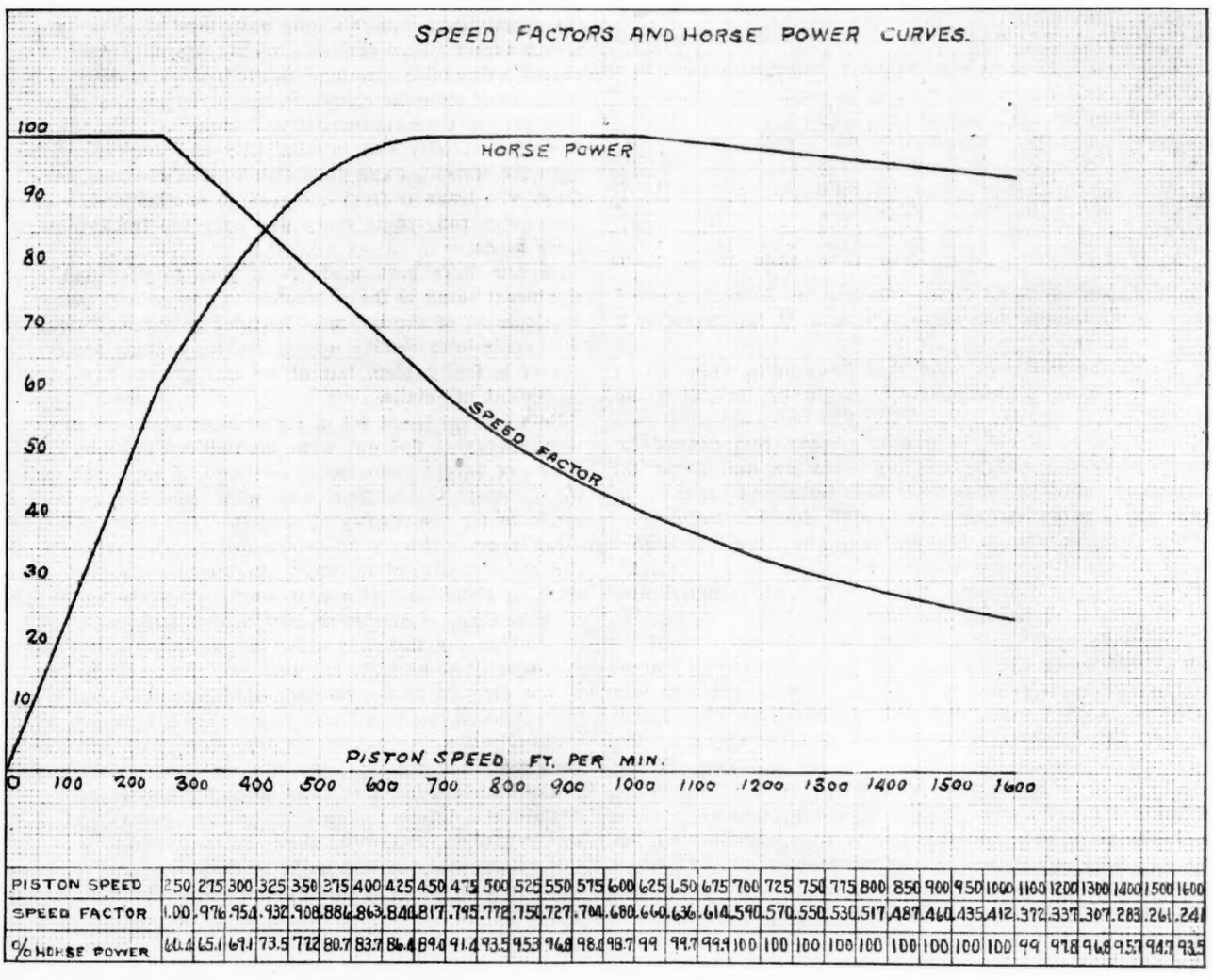
Any fundamental equation which does not take into account the weight of cars or the approximate constancy of resistance between 5 to 10 and 30 to 35 m.p.h. appears to be based on incorrect data. Furthermore, the equation to show the entire range of events should give the resistance at starting, the rapid decrease to say 2 to 3 m.p.h., then slower decrease to 5 m.p.h., practically constant from 5 to 30 or 35, increasing after this on a curved line to agree with certain elements which increase as the speed and for air pressure which increases as the square of the speed.

A curve having such characteristics is shown in Fig. 6. It was produced in order to approximate the resistance of passenger cars, and is intended only for the cars, tender and portion of the weight of locomotive carried on leading or trailing trucks, the machine friction and head air resistance of the locomotive forming part of a separate calculation.

The equation is written with a minus quantity for V thus:

$$R = 5.4 + .002\ (V-15)^2 + \frac{100}{(V+2)^3}$$

This curve gives 18.34 lbs. at starting (approximately true for single cars only), rapidly decreasing to about 6.7 lbs. at 2½ m.p.h., 5.5 lbs. at 10 m.p.h., minimum between 15 and 20, increasing after this in curved line to 7.85 at 50, 12.6 at 75 m.p.h. The figures are only approximately correct for average conditions of weight, length and outward characteristics. It would appear reasonable to suppose that an accurate equation must contain variables for these items, and that as great differences exist for passenger car resistance on account of weight as are known to for freight cars.



PISTON SPEED	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725	750	775	800	850	900	950	1000	1100	1200	1300	1400	1500	1600
SPEED FACTOR	1.00	.976	.954	.932	.908	.884	.863	.840	.817	.795	.772	.750	.727	.704	.680	.660	.636	.614	.590	.570	.550	.530	.517	.487	.460	.435	.412	.372	.337	.307	.283	.261	.241
% HORSE POWER	60.4	65.1	69.1	73.5	77.2	80.7	83.7	86.4	89.0	91.4	93.5	95.3	96.8	98.0	98.7	99	99.7	99.9	100	100	100	100	100	100	100	100	100	99	97.8	96.8	95.7	94.7	93.5

Fig. 8.

FREIGHT CAR RESISTANCE.

In Table 2 the resistance of freight cars of varying weights on straight and level track and in combination with different grades is given. As there is no difference in the resistance between 5 and 30 miles per hour, the table covers the range of ordinary freight car speeds. In explanation of this, it may be stated that the journal friction is greatest at the start, rapidly decreasing after once started and then gradually decreasing to approximately 20 to 30 miles per hour, reaching

its minimum in the neighborhood of these figures and then afterwards being constant or slightly increasing for higher speeds.

Table 2.—*Resistance of Freight Cars, at 5 to 30 Miles per Hour.*

Weight of cars, total tons, 2,000 lbs.	Level.	.05 Per cent. of grade / 1. Pounds per ton resistance	.1 / 2.	.15 / 3.	.2 / 4.	.25 / 5.	.3 / 6.	.35 / 7.	.4 / 8.
20	7.84	8.84	9.84	10.84	11.84	12.84	13.84	14.84	15.84
25	6.62	7.62	8.62	9.62	10.62	11.62	12.62	13.62	14.62
30	5.78	6.78	7.78	8.78	9.78	10.78	11.78	12.78	13.78
40	4.65	5.65	6.65	7.65	8.65	9.65	10.65	11.65	12.65
50	3.94	4.94	5.94	6.94	7.94	8.94	9.94	10.94	11.94
60	3.44	4.44	5.44	6.44	7.44	8.44	9.44	10.44	11.44
70	3.06	4.06	5.06	6.06	7.06	8.06	9.06	10.06	11.06
72	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00

	.45 Per cent. of grade / 9. Pounds per ton resistance	.5 / 10.	.55 / 11.	.6 / 12.	.65 / 13.	.7 / 14.	.75 / 15.	.8 / 16.	.85 / 17.
20	16.84	17.84	18.84	19.84	20.84	21.84	22.84	23.84	24.84
25	15.62	16.62	17.62	18.62	19.62	20.62	21.62	22.62	23.62
30	14.78	15.78	16.78	17.78	18.78	19.78	20.78	21.78	22.78
40	13.65	14.65	15.65	16.65	17.65	18.65	19.65	20.65	21.65
50	12.94	13.94	14.94	15.94	16.94	17.94	18.94	19.94	20.94
60	12.44	13.44	14.44	15.44	16.44	17.44	18.44	19.44	20.44
70	12.06	13.06	14.06	15.06	16.06	17.06	18.06	19.06	20.06
72	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00

	.9 Per cent. of grade / 18. Pounds per ton resistance.	.95 / 19.	1. / 20.	2. / 40.	3. / 60.	4. / 80.	5. / 100.	6. / 120.
20	25.84	26.84	27.84	47.84	67.84	87.84	107.84	127.84
25	24.62	25.62	26.62	46.62	66.62	86.62	106.62	126.62
30	23.78	24.78	25.78	45.78	65.78	85.78	105.78	125.78
40	22.65	23.65	24.65	44.65	64.65	84.65	104.65	124.65
50	21.94	22.94	23.94	43.94	63.94	83.94	103.94	123.94
60	21.44	22.44	23.44	43.44	63.44	83.44	103.44	123.44
70	21.06	22.06	23.06	43.06	63.06	83.06	103.06	123.06
72	21.00	22.00	23.00	43.00	63.00	83.00	103.00	123.00

In a paper entitled "Virtual Grades for Freight Trains," which A. C. Dennis read before the A. S. C. E., December 3, 1902, he states:

"During the past year more than 3,000 miles were run by the writer, with a dynamometer, on heavy freight trains. * * *

"The train resistance, in pounds per ton, compensated for change in velocity head, grade and curvature, was plotted for very many points and speeds for each train, and the mean of these points taken, as nearly as possible, for each train.

"Fig. 7 shows what is believed to be the correct resistance under the conditions given, and differs radically from the results obtained by Wellington and other authorities experimenting with light trains, cars and rails.

"The experiments indicate that the resistances which increase with speed balance very nearly the decreasing journal friction for trains of box cars of 2,000 tons or more, the tare of which is one-third of the gross weight on a solid frozen roadbed. The resistance for such a train is about 4.7 lbs. per ton for speeds from 7 to 35 miles per hour. Warm weather and a less rigid roadbed modify this, somewhat, reducing the resistances at low speed and increasing them at high speed, but the difference is so slight that 4.7 lbs. has been used as a constant. The resistance due to cold varies from enough to skid the wheels, it is said, to practically nothing after the train has been run fast for some time. * * *

"The writer was equally skeptical in regard to the approximate constancy of train resistance until convinced by a long series of experiments. He knows from experiment that a train of about 2,100 tons, with 20 per cent. empties, picked up speed from 29.5 to 30 miles per hour, with the locomotive shut off, in running 2.5 miles on a 0.26 per cent. grade. The writer suspects that a long train of all loads would exceed 40 miles per hour on a 4.3 per cent. grade with the locomotive shut off, provided the train had been running at high speed, but lacks sufficient information regarding resistances at such speed to be able to state definitely. A train of all empties will lose speed in coasting, even on a 0.4 per cent. grade, whatever the speed when starting to coast. It is impracticable to compare the resistance of two trains without knowing the proportion of tare weight, or reducing all actual tonnage to rating tonnage."

(To be continued.)

SYSTEMATIC SIGNALING.

BY C. C. ANTHONY.

It is well known that committees of the Railway Signal Association and American Railway Engineering and Maintenance of Way Association, have been working for several years in the effort to devise a system of signaling which, while providing for all reasonable requirements of American railways, may enable the roads to attain uniformity in their method of conveying instructions by means of fixed signals. The assumption on which this work has been based from the beginning is that reasonable uniformity in signal forms and meanings is desirable; that is, that, within practicable limits, a given arrangement of semaphore arms in certain positions, or of lights of certain colors, the signal "aspect," should mean the same thing to, and require the same action of, the engineman, wherever and whenever it occurs; and that a given command, the signal "indication," should always be given by the same signal aspect. How desirable such uniformity may be is, of course, a debatable question. But it is assumed that the benefit would be of the same character, and perhaps quite as great, as that derived from substantial uniformity of rules; that is, increased simplicity and intelligibility and decreased demands upon the memories and understandings of the men, especially those who transfer from one road to another and, above all, those who run trains every day over the tracks of two or more roads.

Reports have been made from year to year and a very significant thing is the adherence to one general plan in the development of the scheme. Modified recommendations have been made in successive reports, but the changes are evidence, not of a faulty plan, but of natural growth involving improvement of details.

Before a consistent set of signal aspects can be made up it is necessary to find out what instructions must be given by means of fixed signals, what relations, if any, exist between the different instructions, and what means are reasonably available for the display of aspects. The instructions to be given must evidently be determined by the actual practice and requirements of railways. In formulating these instructions as signal indications, it would evidently be legitimate to make them as concise as may be consistent with clearness, to combine any that may differ in wording but not in effect, and, equally, to separate any that may commonly be combined in one formula at the sacrifice of definiteness; but it would plainly be useless to attempt to simplify the scheme by omitting indications needed for the proper operation of trains; the final result could not be other than an insufficient system.

The Standard Codes of Block Signal and Interlocking Rules contain six different signal indications, three "names" and ten "occasions for use" as shown in the table.

It will be observed that no indications are given for the several arms (other than that for the main route) on interlocking home signals having two or more arms—presumably because present practice varies so much that it is impossible to provide concisely worded indications that would fit the conditions on any considerable number of roads.

In the committee reports submitted at the last annual meetings of the Signal and Maintenance of Way Associations, three stop indications are proposed:

1. Stop until authorized to proceed.
2. Stop and proceed.
3. Stop and investigate.

The first is, of course, the equivalent of the indication, Stop, as given for manual block and interlocking signals in the Standard Codes; very likely the additional words might be eliminated as, in the absence of any qualification, no other course would be open than to remain "until authorized to proceed." The second is intended to express in few words the action regularly taken in the case of automatic block signals and leads up to the recommended difference of aspect; several

roads already make a distinction by shape of arm, number plate, marker letter, or the diagonal arrangement of arms and lights recommended by the committees. The third is intended to express the action that must be taken, for example, at an open main-track switch.

Of the proceed indications, the first, No. 4, Continue, is designed to express the action taken, for example, when a main-track switch stand indicates that the switch is all right or when a block station is closed; the engineman simply "continues" to do as he was doing in accordance with the indication of the last block signal passed—continues to look out for a train ahead if the last block signal indicated an occupied block or proceeds unrestrictedly if that signal indicated a clear block. No. 5, Resume normal speed, is simply a separate indication for the "release sign" (usually a distinct aspect) placed at the end of "slow track," which, it is assumed, does not indicate Proceed in the sense of removing a restriction imposed at a preceding signal (other than the slow sign).

The remaining proceed indications:

6. Proceed at normal speed.

7. Proceed at normal speed—prepare to stop at next signal.

8. Proceed at normal speed—prepare to pass next signal at normal speed.

9. Proceed at normal speed—prepare to pass next signal at limited speed.

System.	Kind of signal.	Occasion for use. The signal will be displayed when	Indication. For engineman & trainmen.	Name. As used in rules
Manual and controlled manual block.	Home (and advance) block.	(a) Block is not clear.	Stop.	Stop-signal.
		(b) Block is not clear.	Proceed with caution.	Caution-signal.
		(c) Block is clear.	Proceed.	Clear-signal.
	Distant block.	Home (or advance) signal at (a)	Proceed with caution to the home (or advance) signal	Caution-signal.
		Home (and advance) signal at (c)	Proceed.	Clear-signal.
Interlocking	Home (and advance)	(a) Route is not clear.	Stop	Stop-signal.
		(b) Route is not clear.	Proceed with caution.	Caution-signal.
		(c) Route is clear.	Proceed.	Clear-signal.
	Distant.	Home signal at (a)	Proceed with caution to the home signal.	Caution-signal.
		Home signal at (c)	Proceed.	Clear-signal.
		The Signal will appear when		
Automatic block	Home block.	(a) Block is not clear.	Stop	Stop-signal.
		(b) Block is clear. Second block in advance is not clear.	Approach next home signal prepared to stop.	Caution-signal.
		(c) Block is clear.	Proceed.	Clear-signal.
	Distant block.	Home signal is at (a) or track obstrctd bet. dist. & home signal	Proceed with caution to the home signal.	Caution-signal.
		Home signal is at (c)	Proceed.	Clear-signal.

10. Proceed at limited speed.

11. Proceed at limited speed—prepare to stop at next signal.

12. Proceed at limited speed—prepare to pass next signal at normal speed.

13. Proceed at low speed.

14. Proceed at low speed—prepare to stop,

make a rather formidable array; but the question is, of course, not how many indications are proposed but how many are needed. It may very likely be agreed that Nos. 8 and 12 can be eliminated as the action is substantially the same as that required by Nos. 6 and 10 respectively. On the other hand, an indication for "permissive block" movements, or possibly two, one in connection with normal speed and the other in connection with limited speed at the signal, should be taken into account in making a comparison with the indications given in the Standard Codes. Leaving out of consideration Nos. 4 and 5, there would then be nine of the new proceed indications against five in the Codes.

While the speed indications are, perhaps, used as yet only by implication and to a limited extent, as provided, for example, by special instructions prescribing uniform interpretation of the two or three-arm signals on an entire division, it may fairly be said that all the new proceed indications (including the two suggested permissive-block indications) are little more than new statements of the action that certain signal aspects, to a greater or less extent, now actually indicate. The form taken by these indications is based on two propositions, "speed signaling"; and "continuity of indications" wherever two successive signals are at such a distance from each other that the first, like an ordinary distant signal or a three-position automatic block signal, can reasonably give preliminary indications in accordance with the indications of the second.

The scheme of speed signaling was reported by the committee, and its conclusions were adopted by the American Railway Engineering and Maintenance of Way Association, in 1905 (Proceedings, 1905, pages 494 to 498; Manual of Recommended Practice, page 159). In this scheme it is assumed that the various routes at interlockings may be placed in three groups:

1. The "main" route, on which, when the track is clear, the speed of trains is limited only by such unchanging conditions as grades, curves, movement through towns, etc., which either take care of themselves or are covered by standing instructions.

2. Other important routes, such as those to or from branch lines, running tracks, one of the main tracks at end of double track, passing sidings, and through crossovers to other main tracks with the current of traffic, the turnouts or crossovers in which require limitation of speed, but not very low speed.

3. All other routes—to yards, short sidings, other main tracks against the current of traffic, or to any track over turnouts or crossovers requiring comparatively low speed.

Assuming that the main route and the other important routes (group 2) are provided with equivalent means (such as operation under the block system) for determining and indicating whether or not the tracks are clear, routes in the second group differ from those in the first solely in the necessity for limitation of speed to insure safe movement over the turnouts or crossovers. Routes in the third group require still lower speed than those in group 2 and frequently additional precaution to avoid collision with cars standing on a siding, unauthorized movement against the current of traffic outside interlocking limits, or the like.

Common practice is, of course, to indicate, more or less arbitrarily, the different routes at interlockings by means of the different arms on signals having two or more arms, regardless of the different characters of turnouts and crossovers; and to leave it to the enginemen either to remember the conditions at each place or, if in doubt, to move at a speed that will surely be safe. While accident records may not show that this practice is positively unsafe, it must at least be admitted that it is wholly impracticable to indicate routes intelligibly in all situations by means of semaphore arms, and that indication of safe speeds is generally more important than erring interpretation of signal indications is undesirable. So far as safety alone is concerned, the chief advantage of strict

route signaling seems to be that, if an engineman is always sure what route is indicated, he may sometime be able to avoid a collision by looking ahead and seeing for himself whether the track he is to run on is obstructed. This, however, may better be provided for by block signaling or similar means, as suggested above. On the other hand, safety depends absolutely on restriction of speed within the limits fixed by the character of the turnouts or crossovers. It is therefore felt that indication of safe speeds is generally more important than indication of routes. Of course, in simple situations, however, the indications for speeds will commonly be equivalent to indications of routes.

In the scheme of speed signaling, then, it is provided that routes in group 1 shall be governed by indications permitting "normal speed"—no restriction imposed by signal; that routes in group 3 shall be governed by indications requiring low speed; and that routes in group 2 shall be governed by indications requiring a rate of speed intermediate between the other two, called in the reports "limited speed."

It is obviously impossible to fix upon a single rate of speed for limited-speed routes that would meet the requirements of all railways. Ideally, no doubt, there should be means of indicating by signal various rates of speed at intervals of, perhaps, 10 miles an hour; but it is evidently impracticable to do this with semaphore arms. Three gradations seem, however, possible and sufficient; these can readily be indicated by three arms in the natural order from the top of the mast down—the greatest number of arms, it is believed, whose relative places on the mast can be interpreted quickly and without likelihood of error. It will then apparently be proper for each road to prescribe by rule one rate of speed for limited speed and one for low speed, or preferably one for each on not less than an entire engine division, if conditions seem to make it absolutely necessary to fix different speeds for different divisions.

"Continuity of indications" requires not only that a distant signal shall give a cautionary indication when either the home or advance signal is at Stop—Code indication, "Proceed with caution to the home (or advance) signal"—and shall indicate Proceed only when both the home and advance signals are clear, but that the home signal shall similarly give a cautionary indication when the advance signal is at Stop, and indicate Proceed only when the advance signal is clear. This is the practice, more or less completely carried out, on some roads at present and is recommended because of the misleading character of an unqualified proceed indication at one signal when the next signal in advance is at Stop.

It is also desirable that, when a given signal indicates limited speed, the preceding signal should suitably indicate the kind of movement required by that signal. Without this provision full benefit would not be derived from the limited-speed indication, especially on roads whose conditions are such that a comparatively high rate of speed can be maintained under that indication (40 miles an hour is the actual limit in many cases where limited-speed indications would be given under the proposed system). The preliminary indication referred to is simply the one now given, in effect, by the second arms of numerous two-arm distant signals.

The basis of the proposed proceed indications clearly understood, it will readily be seen that the increase in the number of indications, as compared with the number shown in the Standard Codes, is due solely to the effort to frame indications that will meet the actual present requirements of railways by expressing the action required for the proper movement of trains in certain cases not yet provided for in the Codes. Further than this, the effort has been to offer indications so universally applicable that they may be adopted in place of various indications, now used but not always definitely expressed, that can be interpreted only through knowledge of local conditions.

Considering the proceed indications Nos. 6 to 14, in detail, it will be noted that No. 6, Proceed at normal speed, is exactly equivalent to the Code "Proceed," for the various kinds of signals. Perhaps the Code form is preferable on account of brevity—it would go without saying that, in the absence of any restricting phrase added to "proceed," the train would proceed "at normal speed" or unrestrictedly.

If "continuity of indications" is provided for, the necessity for one of the Code indications, "Proceed with caution to the home (or advance) signal," disappears. Of course, to insure ample space for stopping after the engineman receives the first indication, "prepare to stop at next signal," it is necessary whenever the distance between a home and an advance signal is less than that needed for stopping, that the distant (or other signal giving similar indications for approach to the home) shall be controlled exactly as at present—so that the cautionary indication will be given when the advance signal is at Stop, even though the home is not. Under such circumstances, however, the home signal would also give a cautionary indication, "prepare to stop at next signal." The engineman, therefore, needs but one such indication; if he approaches the home signal prepared to stop and there finds an indication permitting him to proceed but again requiring him to prepare to stop at next signal, he will have no difficulty in stopping at the advance.

Under the proposed system there might, very likely, be difference of practice in respect to the indication to be given by an outlying distant signal when a train is between it and the home. On some roads (as on one or more at present) each distant signal might be arranged to give a stop indication under those circumstances; on others the same indication might be given as when the track is clear and the next signal is at Stop, the condition of that portion of track having been sufficiently indicated, perhaps, by a preceding block signal. It has been assumed, however, that in general, under the scheme of continuity of indications, indications involving preparation to stop at next signal should be given only when the track is clear to the next signal, in accordance with present practice in the case of three-position automatic block signals—a practice that can, and undoubtedly should, prevail in the case of home block or interlocking signals where there are advance signals.

In indication No. 7, Proceed at normal speed—prepare to stop at next signal, as in No. 6, the words, "at normal speed," possibly add nothing to the clearness of meaning. With these words omitted the indication is exactly equivalent to the corresponding Code indication for automatic block signals, "Approach next home signal prepared to stop;" the only material difference is in the use of the word "Proceed," in which respect all the indications from No. 6 down are uniform. In view of the conditions under continuity of indications, it is believed that this indication is properly worded and is sufficient, without modification, to express the action required in connection with the several kinds of signals, when the signal in advance is at Stop. If this is true, not only can one of the Code indications be eliminated, as suggested above, but three of these indications, "Proceed with caution to the home signal," "Proceed with caution to the home (or advance) signal" and "Approach next home signal prepared to stop," can be combined in one—substantially the new No. 7.

Indication No. 8, as suggested above, seems to require no action different from that required by No. 6 and will therefore not be taken into account. No. 9, Proceed at normal speed—prepare to pass next signal at limited speed, is the preliminary indication needed, as explained in a preceding paragraph, to enable trains to take full advantage of the limited-speed indication at the home; it, of course, implies clear track to the home. Like all the remaining new indications, it relates to conditions not touched upon in the Codes and therefore cannot well be compared with the Code indications.

At this point an additional, "permissive block," indication, previously referred to, may be introduced to correspond with the Code indication, "Proceed with caution," used to permit trains to proceed when "Block is not clear" or "Route is not clear." This would complete the list of proceed indications to be given under conditions permitting trains to move at "normal speed" up to, and at the moment of passing, the signal.

The purpose of indication No. 10, Proceed at limited speed, is made clear in connection with the details of speed signaling. It is claimed, however, that the difference in the action required under indications No. 10 and No. 7, and under the "permissive block" indication as well, is so trifling that there is no need of different indications, leading to the complication of separate aspects. But a little consideration will show that the movements of a train under the circumstances represented by these three indications should be quite different. Indication No. 7 would frequently admit of the signal at which it is given being passed at the highest speed and simply requires that the train, whatever its speed, be so handled that it can be stopped at the next signal. Indication No. 10, on the contrary, requires that the speed prescribed for limited speed be not exceeded at the signal but imposes no other restrictions and permits the prescribed speed to be fully maintained beyond the signal and up to the next signal, if there is a signal in advance within reasonable distance; this, of course, presupposes that the signal in advance gives, at the time, an indication not less favorable than Proceed at limited speed, which should be the case when indication No. 10 is given at the first signal, just as indication No. 6 is to be given at one signal when, and only when, the next signal, if there is one within stopping distance, gives some indication permitting "normal speed."

The difference between indications Nos. 10 and 7 is further exemplified by No. 11, Proceed at limited speed—prepare to stop at next signal, which would, of course, be given instead of No. 10 when limited speed is necessary and the next signal is at Stop; under No. 10 limited speed, which may be 30 or 40 miles an hour, may be maintained through to the next signal; under No. 11 the first signal may be passed at limited speed but the train must be so handled, with any necessary reduction of speed, that it can be stopped at a known point ahead (the next signal). The permissive block indication differs from the others in that, while no limit of speed may be imposed (this depends on the practice of the various roads using the indication), the engineman is required so to handle his train that he can stop short of a preceding train wherever it may be found; that is, he must be able to stop at an unknown point. Since, however, it may be convenient and legitimate to give a permissive block indication in connection with a limited-speed movement, an additional limited-speed indication for this purpose may be found desirable.

The reason for two low-speed indications, No. 13, Proceed at low speed, and No. 14, Proceed at low speed—prepare to stop, is found in the fact that there is a certain overlapping of groups 2 and 3 into which routes are divided for the purposes of speed signaling; that is, a route may belong in group 2 so far as its general character is concerned but may require a speed limitation for group 3 because of the character of turnouts or crossovers. Indication No. 13, implying, like No. 10, that the indicated speed may be continued and that the conditions are not such as to require a stop, is designed to be used for these routes when the track is clear and the advance signal, if there is one, is not at Stop. Indication No. 14 is the least favorable of all and requires, not only observance of the speed limit, but such control of the train that it can be stopped at any point if the necessity arises.

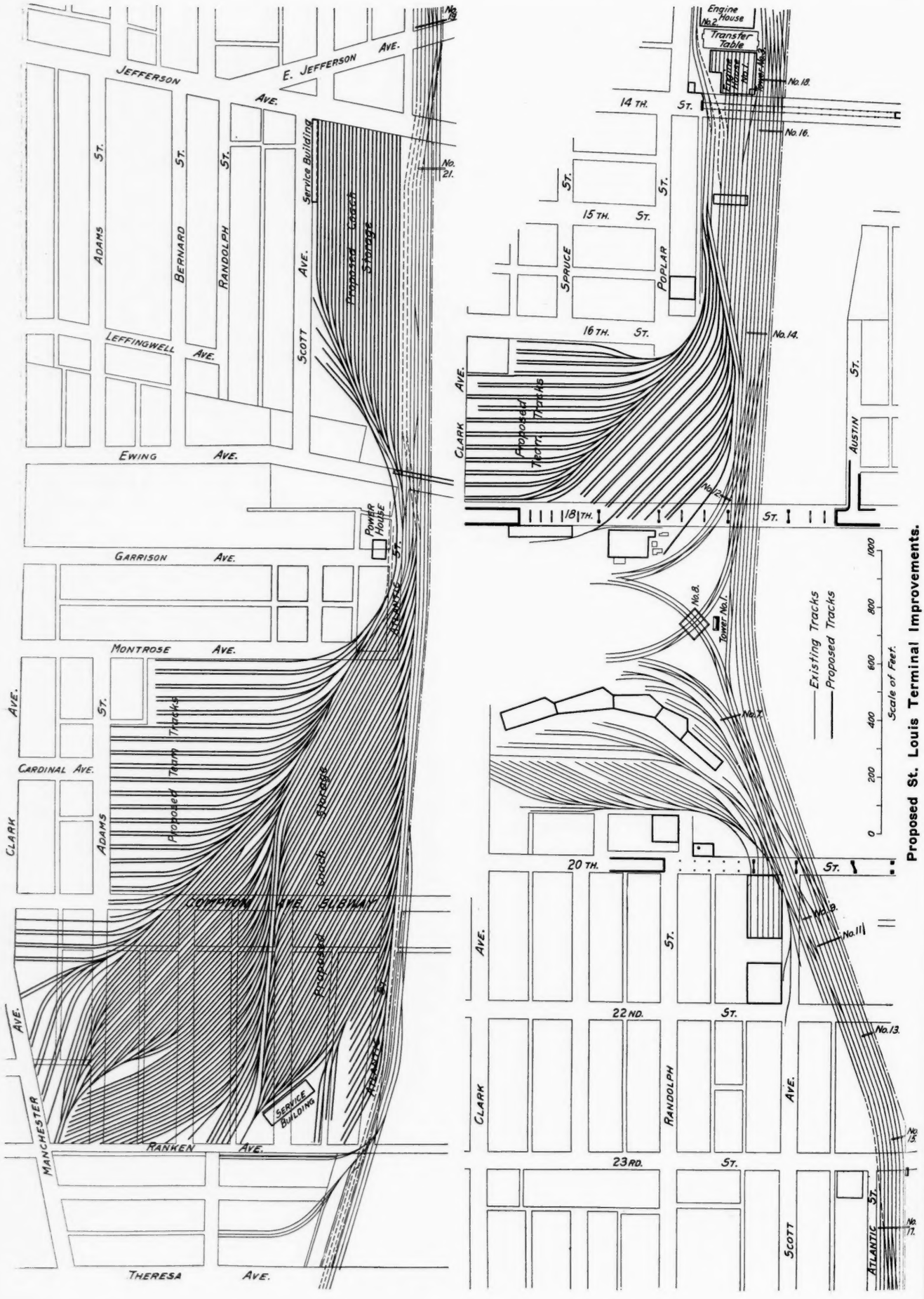
In designing aspects for the indications it was practically assumed that a mast carrying three arms, each arm capable of taking three positions, formed the reasonably available material. It has generally been agreed that the third arm should be used for low-speed indications. There are, however, two ways in which the first and second arms, and their positions, might be used in making up the necessary aspects. The top arm vertical might serve for the indication, Proceed (at normal speed); and at forty-five degrees for Proceed at limited speed; while the second arm could be used for the partial indications relating to the next signal, "prepare to stop at next signal" and "prepare to pass next signal at limited speed;" or the positions of the top arm could give certain indications with no restriction of speed at the signal, and the second arm could give exactly the same indications with the addition of restriction to limited speed at the signal.

The latter plan is, of course, the one on which the aspects shown in the reports are based. It was the first considered and, in spite of earnest advocacy of the other, has been adhered to because, taking into consideration the low-speed indications of the third arm, the three arms indicate and suggest the three gradations of speed in an orderly and obvious way, and because such use of the three arms grows naturally out of the present assignment of the arms on three-arm signals, in many places, to routes requiring different limitations of speed; so that very little explanation would be necessary to make clear the new and uniform significations of the arms. On the other hand, the suggested use of the intermediate position of the top arm to indicate limited speed would be a radical innovation as, in present practice, that position of the top arm either indicates, "Proceed—prepare to stop at next signal," in the case of automatic block and some home interlocking signals, or gives the permissive block indication; and neither of these indications generally involves any limit of speed at the signal where the indication is given; while the proposed limited-speed indication might, on a given road or territory, require for safe movement a speed not exceeding 20 or 25 miles an hour. It has seemed preferable, therefore, to avoid any revolutionary change from present practice and rather to follow a line of natural evolution by, in this case, merely assigning the intermediate position of the arm to one of two indications for which it is now used indiscriminately.

The principal indications and aspects, presented in the last reports, have stood the test of prolonged discussions and are the product of careful and deliberate study. While changes in detail resulting in improvement may yet be made, and the next report, which should be in print in a few weeks, may contain such, it is believed that the scheme is so well settled in all essentials as now to place at the command of the railways a uniform and universally applicable system of signaling.

PROPOSED TERMINAL IMPROVEMENTS AT ST. LOUIS.

The main obstacle that many railway managers have to overcome in providing the public with the transportation facilities that it wants and needs is the interested, or ignorant and misguided, opposition of public officials. A good example is afforded at St. Louis. The people, especially the shippers, of St. Louis, have been demanding for years that the Terminal Railroad Association, of that city, shall improve and enlarge its facilities for getting freight and passengers in, out of and through the city. Four years ago the city council created a Municipal Bridge and Terminals Commission "to investigate and determine the nature and extent of the hindrances to the commerce of St. Louis"; to decide what should be done to improve the situation, and to prepare ordinances and take such other steps as might be deemed necessary to further this end. *The Railway Age*, in its issues of February 14 and 21, 1908, published two articles telling what the commission, co-operating with the Terminal Railroad Association and the officers of the railways serving St. Louis, had done up to then, and outlining their plans for the future. That relatively little progress has since been made is due to the failure of the St.



Proposed St. Louis Terminal Improvements.

Louis council to endorse and give effect to the plans which its own commission, aided by expert advisers, has worked out and earnestly recommended.

As stated by *The Railway Age* in its issue of February 21, 1908, page 241, the Terminal Railroad Association bought about 25 acres of land in the Mill Creek valley district, in the neighborhood of Compton avenue, west of the Union passenger station, at a cost of between $2,500,000 and $3,000,000. This would give 1,846,000 additional sq. ft. of team track room if ordinances for vacating the streets in the vicinity were passed. The Municipal Bridge & Terminals Commission framed the necessary ordinances, which were introduced in both houses of the city council in September, 1908.

The property was acquired both because the commission urged such action and because the Terminal Association saw that ultimately it would need it. A large part of it is crossed by numerous streets which have never been opened or used, or even marked off, as thoroughfares, since they were originally dedicated by the owners of abutting property to public use. Cows graze peacefully in some of the theoretical highways. Dozens of railway tracks cross at grade those parts of such streets as Compton avenue and Ewing avenue as actually are used. Trains are constantly going back and forth; vehicles and pedestrians are delayed from 5 to 15 minutes in crossing the streets; and when permitted to cross negotiate the passage under hazardous conditions.

The ordinances provided for the closing of a number of streets, which are such only in a technical sense. The only one of these which is in any considerable use is Ewing avenue, and as it approaches the valley with sharp bends on both north and south sides, and with a steep hill on the north side, and as the part of the street in the valley is crossed by more than 30 railway tracks, it did not seem to the commission that, even if there were traffic to warrant it, a satisfactory separation of grades at Ewing avenue would be practicable. Two other short streets, at present open, but very little used, it was also proposed to close, namely, Atlantic street, between Ewing avenue and Montrose street, and Montrose street, between Scott avenue and Atlantic street.

To take the place of Atlantic street, it was proposed to open and improve a new street between Ewing avenue and Garrison avenue, about 100 ft. north of Atlantic street, at the expense of the railways. It was also proposed to separate the railway and street grades at Compton avenue by elevating over 40 railway tracks, and depressing the street under them, making a first-class thoroughfare that would be free from dangers and delays. This work at Compton avenue, which would cost approximately $350,000, was to be done at the expense of the Terminal Association, which was to give a bond of $50,000 that it would carry out the provisions of the bill in every respect, and a further bond of $100,000 that it would complete the subway at Compton avenue to the satisfaction of the city within three years from the date of the approval of the ordinance. The Terminal Association agreed that the city might construct, maintain and renew sewers and water pipes in the vacated streets, and also agreed to take care of its tracks and other property while the construction or repairing of sewers and water pipes was going on. The Terminal Association futher ageed to relocate and protect all existing sewer inlets, fire hydrants, telegraph, telephone and electric light poles, conduits, water pipes and gas mains, the relocation or protection of which may be made necessary by work done under the ordinance; and to limit its rights in the vacated streets and alleys so that the city or anyone to whom it may give the right can construct and maintain conduits under them, provided these conduits shall be installed without expense to the Terminal Association and without material interference with its business. No work was to be done on the subway or its approaches until complete detailed plans had been approved by the Board of Public Improvements, under whose supervision and control construction work was to be done. The Terminal Association agreed to keep the subway in good condition, and to hold the city harmless from any suits for damage during its construction.

The growth of commerce and traffic at St. Louis makes imperative such improvements as those proposed. The bank clearings of the city increased from $1,366,703,956 in 1897 to $3,165,619,327 in 1907, or 132 per cent.; the tonnage crossing the Mississippi river at that point increased from 9,089,261 tons in 1897 to 20,304,326 tons in 1907, or 125 per cent. During this period there was not a corresponding increase in terminal facilities. The following tables show the present capacities of the yards of the Terminal Railroad Association between Fourteenth street and Ranken avenue, and also the capacities which they would have if enlarged as proposed:

80-ft. Passenger Cars.

Name of yard and use of track.	Present.	Proposed.	Inc. or dec. Change.	Inc. or dec. Per cent.
16th street.—Storage	230	.....	Dec., 230	Dec., 100
21st street.—Storage	76	76	.....	.....
Head end and express	77	77	.....	.....
Atlantic street.—Storage	228	212	Dec., 16	Dec., 7
Atlantic street.—Repair	...	.....	.....	.....
Compton avenue.—Storage stub tracks	54	142	Inc., 88	Inc., 163
Do.—Storage double ended	...	532	Inc., 532	.....
Do.—Repair	...	32	Inc., 32	.....
Total	665	1,071	Inc., 406	Inc., 62

40-ft. Freight Cars.

Name of yard and use of track.	Present.	Proposed.	Inc. or dec. Change.	Inc. or dec. Per cent.
16th street.—Team track	189	487	Inc., 298	Inc., 158
16th street.—Storage track	...	47	Inc., 47	.....
Compton avenue.—Team track	289	529	Inc., 240	Inc., 83
Compton avenue—Storage track	...	91	Inc., 91	.....
Total	478	1,154	Inc., 676	Inc., 141½

If the proposed plans were carried out there would be an increase of 62 per cent. in the Association's passenger facilities and of 141½ per cent. in its freight facilities. The larger part of the increase in freight facilities would be east of Eighteenth street, where it is most needed. This increase east of Eighteenth street would be made possible because it is proposed to store west of Ewing avenue the passenger coaches now stored east of Eighteenth street. If it should be found that the increase of freight facilities in the Eighteenth street territory was insufficient an additional freight yard with a capacity of 120 cars could be made on Clark avenue east of Twenty-first street by moving coaches stored there to the new yard west of Compton avenue.

The enlarged facilities would be of much value to the Terminal Railroad Association. They would be of even more value to the merchants and manufacturers of St. Louis. The granting of the privileges asked would interfere with no public interest. For the city to demand financial compensation for the streets vacated would be to exact payment for what it does not own, as the title to the property over which the streets constitute an easement is still vested in those who dedicated it to public use or from whom it was taken by condemnation proceedings, or in their successors and assigns. It, therefore, does not seem just for the city to require compensation for vacating the streets. It is conservatively estimated that the increased income and saving to the municipality would amount to between 2 and 3 per cent. per year on the value of the street area, this estimate being on the basis of the value of the adjacent property.

The benefits that would be derived by shippers and the public, as well as by the railways, from the execution of the Terminal Association's plan are so clear that the ordinances embodying them, which were framed by the Municipal Bridge & Terminals Commission, were indorsed by the city legal department, the president of the Board of Public Improvements, the street commissioner, the sewer commissioner, the engineers of the various railways affected, the Business Men's League, the Merchants' League, the Missouri Manufacturers' Asssociation, the North St. Louis Improvement Association and the South Broadway Business Men's Association. All of the organizations of business men mentioned adopted resolu-

tions favoring the passage of the ordinances. Representatives of 95 per cent. of the freight tonnage of the city advocated their enactment.

But when the ordinances were introduced in the assembly last September, accompanied by a message from Mayor Rolla M. Wells, urging their adoption, they were referred to the railway committee, consisting of three members, and have been the subject of controversy ever since. In the early part of March the majority of the committee unexpectedly reported the ordinances with a number of important amendments. These were in substance as follows:

(1) They restricted the streets to be closed and crossed by tracks.

(2) They provided that the railway tracks be carried over Compton avenue on a viaduct instead of under it in a subway, and that the Terminal Association should deposit $400,000 in cash with the city with which to build the viaduct and file a bond of $500,000 to accept responsibility for all damages that might be sued for by property owners in the vicinity.

(3) They propose to require the Terminal Association to connect its tracks with the "free bridge," across the Mississippi, for the construction of which the city has been authorized to issue bonds, and to permit the use of its tracks on reasonable terms by any railway that may come into the city over the free bridge and allow any such railway to operate its trains on the Association's tracks.

(4) They proposed to fix a maximum switching charge of $2 a car between all points within the city limits regardless of whether the switching is done over the tracks of one or more companies; a charge of 5 cents per ton when shipments are in less than carload lots, and to require that the Association shall expressly make its rates subject to supervision by the Public Utilities Commission of St. Louis, which has been created by the state legislature.

(5) It was proposed to provide that the charges for passenger and freight traffic from points outside of the St. Louis district to points inside the St. Louis district or from points inside the St. Louis district to points outside of the St. Louis district should be no higher per mile than the rates generally fixed between points outside of the St. Louis district. The purpose of this is to compel the various railways entering the city to absorb the bridge tolls on traffic from points within 100 miles of St. Louis as well as from points outside of the 100-mile limit.

The report of the committee was referred to the Municipal Bridge and Terminals Commission for its consideration. A conference between the commission and the executive committee of the Terminal Railroad Association was held on March 3, and the commission returned the amendments to the council with a number of criticisms and suggestions. Regarding the rate questions raised by the committee, the commission said that the regulation of switching charges within the city of St. Louis was a matter for consideration by the state railroad commssion or by the public utilities commission. As to the rates to be applied on through business, these already had been satisfactorily and reasonably adjusted by the trunk lines in accordance with the requests of the Bridge and Terminals commission and were for the most part subject to the jurisdiction of the Interstate Commerce Commission. The plan to elevate the tracks instead of carrying the street over them, it was contended, was the only practicable scheme for securing a satisfactory lay-out providing proper street grades in connection with any general scheme for the separation of grades throughout the valley. That this is the case had been shown by numerous conferences of engineers representing both the railways and the city. It was stated that the Terminal Association and the commission did not decline to agree to carry the streets overhead if any feasible plan should be proposed, but no such plan had been suggested in the proposed amendments. The terminal association, it was added, was perfectly willing that other railways which might enter the city should use its tracks, but of course it could not allow them to run their trains wild over its rails. Existing ordinances provide for the use of its facilities on equal terms by any railways that desire to do so, and the by-laws of the terminal association also contain similar provisions. The terminal association would have no objection to arranging connections with the proposed free bridge if it was ever built, and, in fact, would be glad to have connection with it and to use it.

Despite the earnest recommendations of its own commission, of the executive department of the municipal government, and of the business interests of the city, no final action on the proposed ordinances has yet been taken. The present, when traffic is comparatively light, would be an ideal time for the terminal association to make the desired improvements. But because traffic is light, the need for the improvements is not so keenly felt as it was two years ago, and so non-action continues. There is no serious doubt that in due time almost the exact improvements proposed will be made. But when business picks up, and the movement of the traffic gets heavy, there probably will once more be congestion on the terminals at St. Louis, at least temporarily, and no doubt the terminal association will come in, as it has before, for hot denunciations by shippers and politicians for having failed adequately to enlarge its facilities.

UNIFORM CLASSIFICATION.

BY SAMUEL O. DUNN,
Western Editorial Manager of the *Railroad Age Gazette.*

II.—UNIFICATION OF RULES.

The unification of rules is really the most important undertaking of the working committee on uniform classification. Each individual or concern feels a more direct and acute interest in the ratings and carload minimums that directly affect his or its particular business; but it must be obvious that, in a broad sense, the unification of rules is of general and fundamental importance. The rules prescribe the conditions on and the restrictions under which goods will be transported. They fix the contract conditions of bills of lading. They should furnish a clear interpretation of the meaning and application of all classification provisions. Not only do the rules apply to the rates on classified articles, but generally they are made to apply to the immense volume of traffic moving under commodity tariffs.

The Official classification contains 28 rules, the Western, 32, and the Southern, 33. The differences between them are mainly matters of detail, but even unimportant differences in rules governing conditions of carriage, bill of lading contracts, marking of L. C. L. freight, packing and package requirements, etc., are enough to cause constant and considerable annoyance and trouble to shippers who continually are sending goods from points in one classification territory to points in other territories and often have to comply with differing rules governing the transportation of the same shipment.

An eastern shipper of iron bolts, knowing that a gunny bag is accepted as equivalent to a box or barrel in the East, and possibly having made C. L. shipments in bags to the West, orders an L. C. L. shipment in a bag to some far western point. He is chagrined to find that the Western classification only provides specifically for bolts in bags *in carload lots;* that under the provisions of Rule 14 he must pay a rate of one class higher on L. C. L. shipments of bolts in bags than on shipments in barrels, boxes or kegs; and that the higher rating due to this difference in the classification rules has absorbed his profit or more.

The following abstracts of rules governing corresponding matters in the Western and Official classifications illustrate the differences existing between the various classifications, and

show what a large amount of work must be done, and how many compromises must be affected, to secure uniformity:

Comparison of Rules in Western with Official Classifications.

Rule No.	*Western.* Provides	Rule No.	*Official.* Comparison
1.	Weights charged for	6.	Practically identical
2.	Prepayment required	16a.	Practically identical
3.	Misrepresentation	4a.	Practically identical
4.	Subject to B. L. conditions	1.	Practically identical
5.	Charges on complete article	22.	Practically identical
6.	C. L. weights	5a & b.	Practically identical for tank cars
		5b.	Practically identical as to conditions under which C. L. rates will be applied, but adds to and materially strengthens rule as to split receipt or delivery
6b.	Minimum C. L. weights	27.	Discussed under heading "Minimum carload weights"
7.	"Any quantity" ratings	13.	Practically identical as to freight having no C. L. ratings
		10.	Differs vitally as to mixed C.L.
8.	Part carloads	5c.	Differs in limiting application to "package freight," but does not except a number of articles specifically excepted by Western Classification
9.	Live stock with household goods, 10 head at goods rate.		Household goods description includes 5 head of stock at goods rate.
10.	Protection of perishable property from cold	17.	Practically identical except that no exception is taken to trees and shrubbery and no reductions in rating is made for returned stoves.
11.	Packages containing articles of more than one class	15a.	Practically identical
12.	Articles of unusual length	7a.	Materially different
13.	Certain dunnage carried free	19a.	Practically identical as to open car freight, but also provides weight allowance for lining of cars containing perishable freight
14a.	Ratings applicable on freight according to different kinds of packages		No similar provision made, but more liberal specifications as to packages in descriptions of articles
14a.	Insecure packages	2a.	Practically identical
14b.	Fiber or strawboard boxes	2b.	Unified rules being considered for adoption
15.	Maximum charge for L.C.L. shipments	11.	Practically identical
16a.	L.C.L. shipments of bulk freight not taken	8a.	Practically identical
16b.	Owners to load and unload C. L. freight	8b.	Practically identical
17a.	L.C.L. shipments on open cars	7b.	Practically identical
		7c.	But makes the minimum weight 1,000 lbs. lower and makes loading through 6-ft. side door of a box car the limit for both long and bulky articles, while Western makes a 6-ft. side door the limit for bulky articles and the end window of 36-ft. car the limit for long articles.
18.	Shipments on open cars, small parts must be removed		Provided with descriptions (See Machines, Machinery, etc.)
19.	Empty packages returned		No provision
20.	Carriers' option of loading and transfer		No provision
21.	Rules to govern where mixed cars are specifically authorized		No provision, but general carload mixtures authorized by Rule 10
22.	Car service charges	9.	Practically identical
23.	Shippers' instructions to govern in inspection of freight by consignee		No provision
24.	Ice with perishable freight furnished by shipper, carried free		No provision
25.	Refusal of freight liable to damage other freight	20.	Practically identical
26.	Charge on articles S. U. or K. D.		No provision
27.	Marking L.C.L. shipments		Differs materially
28.	Instruction applicable to "order" shipments		No provision
29.	Freight with lottery coupons, not received		No provision
30.	Term "nested"		Practically identical. See conditions under "Explanation of Characters" O. C. 34, page 23
31a.	Articles in the rough	21a.	Same, except that "bent" is excluded
31b.	Articles in the white	21b.	Identical, but would include "bent"
31c.	Articles finished	21c.	Identical
32.	Tank cars for freight		No provision. See Rule 5A for minimum weight on articles in tank cars

Rules in Western Clasification for which There is no Corresponding Rule in Official Classification.

14a. Ratings fixed according to differing risks on freight in less desirable packages.
19. Empty packages or carriers returned at reduced ratings.
20. Carriers' option of loading or transfer
21. Rules fixing a minimum proportion of any article in any carload mixture authorized in the Classification.
23. Shippers' instructions as to inspection by consignee.
24. Ice furnished by shipper carried free with perishable freight.
26. Charge regulated on articles set up or knocked down.
28. Instructions to govern handling "order" shipments.
29. Freight with lottery coupons not handled.
32. Tank cars, no guarantee to furnish.

Rules in Official Clasification for Which There is no Corresponding Rule in Western Classification.

2a. Contents of package to be stated on shipping receipt, general terms not to be used.
4a. Agents must assure themselves that contents of packages are as represented.
b. Prepayment not accepted unless Agent is satisfied article is correctly described.
8b. Owners required to load and unload heavy or bulky L.C.L. freight which station employees cannot handle.
10. General provision for mixing L.C.L. freight.
12. Railroads furnish ice and salt with perishable freight, third class or higher, in lots of 10,000 lbs. or more.
14. Ratings on articles in glass or earthenware fixed by rule where no specifications are shown with descriptions.
15b. Minimum charge for L.C.L. shipments.
15d. Separate charges on L.C.L. shipments from two or more shippers to one consignee or from one shipper to two or more consignees.
15e. Charges on shipments combined in packages by forwarding agents.
16b. Guarantee accepted on freight for which prepayment is required.
16c. Adjustment of guaranteed charges when not paid at destination.
18. First-class fare to be paid when attendants in charge of freight are required to pay fare.
19b. Weight allowance, for feed and water, on shipments of live poultry.
23. Articles not provided for in Classification to be rated by analogy.
24a. Agents will not tally shipments of lumber or forest products nor issue receipts or bills of lading specifying number of pieces except on export freight.

It does not follow, of course, because a provision appears only in one classification, that it is inoperative on lines working under another classification in which it does not appear, for it may be covered by the instructions of individual roads to their agents or applied by them to certain traffic by commodity tariffs.

A good illustration of the interest of the public in uniform rules is to be found in the culmination at this time of an effort of several years duration to bring about uniform regulations for the construction of and the weight limits to be applied to strawboard and pulpboard boxes used as shipping containers. The manufacturers were interested in standardizing packages that would be acceptable east, west, north and south, and the carriers were and are anxious to get packages which, while giving reasonable latitude to the shipper, will also bring about some reductions in loss and damage of freight. As a result of much conference between interested shippers, manufacturers and classification committees, a set of rules was recommended by the manufacturers to the carriers. After further conferences the rules were referred to and have been revised by the working committee on uniform classification. These rules have now been adopted by the Western and Southern classification committees and will shortly be considered and in all probability adopted by the Official classification committee, to the satisfaction of all concerned.

In some cases restrictions now applied in only one territory, or perhaps two, may, as a result of the work of the committee, be abolished. In other cases requirements now imposed in but one or two territories may be extended throughout the country. The benefits that all shippers will derive from uniform requirements and practice will much more than compensate for the additional trouble to which some may be put by the extension over the whole country of requirements and restrictions that are now imposed only in a part or parts of the country. Regulations have grown with the experience of three score years and ten in the relations of common carriers to the public which need revision; expressions have crept into use which need modification; so it is probable that at this time as a result of consistent, earnest effort much will be done toward improvement in these respects.

The most vital difference in the rules relates to shipments in mixed carloads. Rule 10 of the Official classification authorizes carload rates on mixed shipments. "If the articles are of more than one class," the rules provides, "the carload rate and the minimum carload weight attaching to such rate in the highest class shall be charged on all the articles that

make up the carload." The Western classification, on the other hand, provides (Rule 7) that "no two or more articles shall be shipped in mixed carloads unless so provided for in the classification." In the body of the classification mixed shipments of a number of specified commodities are authorized specific classes and carload weights being provided for them. The Southern classification is similar to the Western in this respect, but it authorizes carload rates on even a much smaller number of mixed carloads than does the Western. The privilege of mixture has also been given to a limited extent to jobbing and manufacturing centers in the West, and to a still more limited extent in the South, by commodity tariffs. The result is that while an individual shipper can get a carload rate on a mixture of practically any commodities whatever which have carload ratings in official territory, the shipper in the West or the South can get a carload rate on mixtures of only a relatively few analogous articles, such as agricultural implements or furniture, or on articles that are intended to serve a joint purpose, such, for example, as bee hives and bee comb foundation starter.

But while the Western and Southern roads restrict the mixing of different commodities to get carload rates within much narrower limits than do the Official classification lines, the latter absolutely prohibit the application of carload rates on mixed C. L. of either different commodities or different lots of the same commodity, when the freight is owned by *different shippers*, while the western and southern roads do not specifically forbid this. Official classification Rule 5B specifies the conditions under which a carload rating can be obtained, and a note to this rule says: "Rule 5B will apply only when the consignor or consignee is the *actual owner* of the property." Similarly, a note to Rule 10, which provides for mixed carloads, says: "Rule 10 will apply only when the consignor or consignee is the actual owner of the property." There is no such provision in either the Western or Southern classification and nothing therein prohibits any number of shippers from combining their shipments to make up a carload, provided the shipments are "received in one day from one consignor (who may be merely a forwarding agent), under one bill of lading, and delivered under one expense bill to one consignee (who may be an employee of the forwarding agent or one of the consignees).

Now, the western and southern roads are opposed for several reasons to the extension of the principle of mixed carloads into their territories. The making of lower rates on C. L. than on L. C. L. shipments is economically and ethically justifiable only when the spread between the two kinds of ratings is not too great, and when discrimination is not worked in other ways between different communities and shippers. The western roads contend, however, that the eastern roads in some cases have made the spread between C. L. and L. C. L. too great, and that by so multiplying carload ratings, and then providing for mixed carloads, they have granted carload ratings to articles that do not move in large enough volume or that possibly never have and probably never will move in straight carloads so as to be economically or ethically entitled to carload ratings if *moving by themselves*, but which, nevertheless, are handled at C. L. rates for shippers who are fortunate enough to be able to make up a carload by mixing the articles in question with other articles that also have been given C. L. rates. This, it would seem, works a discrimination against a shipper handling only one article, and who because he handles nothing that he can mix it with, must pay the L. C. L. rate.

The eastern roads defend Rule 10 on the ground that from a transportation standpoint, C. L. is more desirable than L. C. L. traffic because it costs a great deal more to handle the latter. Twenty-two years ago Albert Fink elaborated the theory of the eastern lines in an argument before the Interstate Commerce Commission in which he contended that the cost of handling L. C. L. traffic was from 47 to 100 per cent. more than the cost of handling C. L. traffic. The western and southern roads contend that the eastern roads exaggerate the difference in cost and that their position is inconsistent, for, while stoutly defending their course in letting the same shipper mix different articles to get a carload rate, the eastern roads fought before the Interstate Commerce Commission and are now fighting in the courts the forwarders of freight who seek to combine consignments belonging to different owners in order to get a carload rate. It is asked, if it is an advantage to the carrier to have shipments consolidated in carloads in the one case, why not in the other? And if it is not advantageous in the one case, why is it in the other? The eastern roads say that commercial conditions in the East have been adjusted to their policy of allowing mixed shipments of different commodities belonging to the same owner, and that much harm would result if the privilege were withdrawn, but that, owing to their very large number of carload rates, they could not grant also the privilege of mixing goods belonging to different owners without having their L. C. L. traffic very greatly reduced and their revenues seriously affected. The western and southern roads reply that commercial and industrial conditions in the West and South have been shaped largely by their policy of making carload ratings on many commodities only between points where legitimate carload traffic could be developed, and that for them to now change this policy, and, like the eastern roads, multiply carload ratings, and permit mixed carloads, would cause serious harm to many concerns and communities and, by reducing L. C. L. traffic, would seriously affect their revenues.

There is truth in the contentions of both sides. For example, it is probably beyond all question that, on the average, C. L. business is more profitable to the roads than L. C. L. But they always will have to handle L. C. L. business, and to do this they must furnish expensive facilities. Since they must furnish these expensive facilities, it is obviously to their interest to have enough L. C. L. business paying relatively high rates to earn a return on the facilities. This is to the interest of those who must, in any case, ship in less-than-carloads also, because the less shipments there are to pay the expenses of L. C. L. traffic, the more must each shipment be made to contribute to the expenses if the service is to be well and profitably maintained.

The carriers in the South and West cannot reasonably be expected to agree to the extension of Rule 10, and it is a question whether the greater number of commercial interests in those territories would not stoutly oppose its general application. Is the existence of any general rule providing for mixed shipments—whether by one or more owners—justifiable? Is not Rule 10 really tantamount to the making of carload rates on aggregated less-than-carload shipments, from one shipper for distribution among several consignees, or from several shippers to one consignee, and, if so, it is not inconsistent, as already stated, with the effort of the eastern carriers to defeat the practice of "forwarders" in making consolidated carload shipments?

On the whole it would seem, that, in the interest of uniformity, it would be both feasible and justifiable for the eastern roads to abolish Rule 10, and for the roads in other sections to follow their example in discouraging the consolidation of shipments by forwarders. But, unfortunately, there is no reason to expect that representatives of the various Classification committees on the "Working Committee" will be able to reach any agreement about this very important matter, or that shippers would be satisfied with any agreement they did reach. The question of mixed shipments, like the other matter of carloads and less-than-carload regulations is intimately connected with the matter of ratings; and it will continue to be found in the future, as it has been found in the past, that the nearer the question of ratings is approached the harder becomes progress toward uniformity of classification.

(*To be continued.*)

A TRAINMASTER'S VIEW POINT.

BY FRED. C. LETTS.
Trainmaster Union Pacific R.R., Laramie, Wyo.*

I am neither misanthropic nor a pessimist, though there may appear a taint of both in this word picture of a two years' experience as a trainmaster on a heavy trunk line. On the contrary, my disposition is rather buoyant, and I am inclined to look on the bright side of all things. Perhaps a few years more and I myself may look at many of the deductions made as false or without sufficient foundation in fact. I am not intending to write about what a trainmaster ought to do; this I leave to others who can better draw the high ideal. I shall endeavor to depict that which his environment compels him to do, and incidentally hint at that which the public, the shareholder and the management ought to do to strengthen his hands and enable him to become a more efficient officer.

It appears to me now that the position of the trainmaster is vortical in railway activity. As those connected with the various branches of the service go round he gets from each a twist of greater or less severity. The traffic department naturally complain of the service; they say nothing is left to offer the shipper in solicitation. The passenger department oppose stopping through trains for local business, while the importunities of the rural population, to the contrary, backed up by railroad commissions, are almost invincible. In the judgment of the government post office department and others we do not give mail clerks and express messengers time enough at stations, but in the opinion of the superintendent of transportation too much. The management want more tonnage—the train and enginemen, and everybody else, including the public, less. The mechanical department say if we would cut the time at terminals and stations the power would make a better showing. The claim department insist that more time should be taken to obtain a dependable seal record and check of freight unloaded at way stations. The federal agents insist on a very thorough inspection of safety appliances and air, and, as a grand finale, our competitors, it is alleged, make a much more creditable showing in all these particulars, and we are regaled with the figures which seem to prove it, although we suspect the high mark of the other fellow is the only part of his record that is used.

All this exercises my judgment. If I think I am right about any of these propositions it is so decided, so far as my authority goes. Some of my co-ordinates say I am obstinate, but I figure that if I am, to succeed, it must be solely on my own judgment. If that is good, I am all right; if bad, the sooner I find it out the better for both the company and myself.

This part of the work is the lure of the rail; its fascinations are irresistible. There are developed every hour new and interesting problems. The older officials tell me that I shall soon find it in the files; that it all comes around in cycles, and that there is nothing new, even in railroading.

Shortly after my promotion I resigned from the order of railway conductors, as I made up my mind at once that I could not ride two horses. This was done with some reluctance, and I also felt the loss of my "rights," upon which I had banked so much—a sort of accumulated stock in trade from which I could hardly have been jarred loose by any ordinary upheaval of official wrath or financial company misfortune. I was fortified by seniority and a membership in the O. R. C.—stock at this time worth more than 100 per cent., as there was a new run going on which would have given me an opportunity to move to Terre Haute—something my wife and I had speculated on frequently.

I began to realize, after one or two accidents had occurred, that I was now responsible for all the trains instead of one, and that such occurrences were looked upon by the management as entirely unnecessary and *always* avoidable; and further, that under the rules in effect every one concerned was at fault, and it was up to me to lay about in a wild sort of way in the application of the whip of discipline.

I, as well as nearly all of the other trainmen, had conceived the idea, from my train experience, that the discipline as usually administered was unfair. I also had read a great deal about the American railroads comparing unfavorably with the European roads in casualties.

My father had been an engine driver in Scotland. I had, before his demise, absorbed something of the foreign practice, both orally and from copies of the rules he had brought with him from the old country. I thus became imbued with the idea that our American fault was more in the "divided responsibility," which had a strong tendency to influence the train and enginemen to take chances. They could figure that in case of trouble, the organization, the divided responsibility, the political and social influences and personal persuasion would in some way carry them through; and it was a fact that one or the other, with very few exceptions, did actually accomplish what was expected in this direction.

"Chip" Smith, one of the best freight conductors on the division, coming north with the stock pick-up, was hit in the Stoneville yard by a following freight not under control in yard limits. I discharged the engineer and took no action with the conductor. The testimony indicated clearly that Smith's crew was chaining up a car, which required their combined effort. They had finished and were just starting when the following train, taking it for granted that Smith's train must be further ahead, came into the yard too fast and was unable to stop before striking the way car. Smith dropped off and swung his hand lantern, but, of course, this could not be seen as far as the tail lights. The engineer acknowledged his responsibility, but said it was a "trap"; if he had been flagged he would have stopped in plenty of time; air was working good, but had not expected to find them still in the yard at Stoneville.

My attention was called, before the papers were filed, to Rule 106, "Take the safe side," etc., and a few others by which I ought to have held Smith and the rear brakeman, who, by the way, had his arm wrenched trying to get the car chain around the center pin, and was in the hospital. I had sent him out some flowers, which promised to further embarrass me in case I was compelled to discharge him when he reported for duty.

My explanation to the superintendent was that a crew could not do switching in yards and keep a flagman out in both directions; that crews did not do so in practice, and were only expected to do so when an accident occurred, which was unfair. Evidently this went in one ear and out the other. After I had made a lengthy argument on the equities of discipline, he said: "Young man, when you get some more experience you will learn that it is easier to hold 'em all."

I soon got into another rest-breaking complication. Still in pursuit of the old country theory of preventing accidents before they happen, I found it necessary to discharge engineer Smithers for insubordination. For an ulterior reason he refused to take an engine out, on the pretext that it was not in a safe condition. I knew something about the machine, and after satisfying myself personally that the crown sheet was all right gave him another opportunity to go. He was stubborn and made his refusal more emphatic than at first. Another man was called, who, informed of all the circumstances, took the engine to its home terminal where a careful examination was made by experts, who pronounced the boiler in a safe condition. There were a number of staybolts leaking, but nothing serious. We discharged Smithers. The superintendent was with me this time, as he had some inside knowledge of bad habits on part of the engineer. He had warned him once or twice to discontinue the frequenting of saloons, with the effect only of making him a little more cautious.

The local committee took the case up. I refused to reinstate

*Mr. Letts was brought up in Illinois and has served as freight brakeman, freight conductor, passenger conductor and trainmaster, holding the last-named position on the Union Pacific for the last two years.

the engineer. The general superintendent was appealed to after the superintendent had refused to reverse me, who sustained our decision. The officers of the brotherhood then took the case to the general manager. It seemed Smithers was quite a prominent member of the organization, and while the men all knew he was addicted to the liquor habit, he forced them by his influence and will power to fight his case to the highest court. It is not ended yet. It has been a fearful mess. I wonder, when I read the motto, "Friendship and Sobriety," what they are really intended to represent.

I get along with switchmen as well, perhaps, as other trainmasters do, but they have certainly put some gray hairs in my head. I discharged Bill Burke for leaving his engine on the "spot" and visiting a saloon during working hours. This, after a warning not to do this particular thing again. I always make it a practice to speak to the men about any minor infractions of the rules, and never administer discipline for violations of this character until they have had a definite understanding with me as to what is required of them. I warned Burke twice, and told him the second time plainly that I would discharge him if he was caught in a saloon again.

The committee were in early the next morning. We went over the case in detail; they intimated that the officials drank when they wanted to; that "Skinny" Roberts, another switchman, had been in jail for getting drunk and *he* had not been discharged (the legal department had notified us he was an important witness in a personal injury case); Burke had been recently the local chairman, and the committee were satisfied there was something personal in the matter, and so on; and unless I reinstated him before 9 o'clock the next morning they would walk out.

I went in to a conference with the superintendent as soon as they departed from the office. It seems Bill had got the Congressman from that district to go up and "make a talk" for him. We had some important matters before Congress, and it would not do to antagonize the home contingent. While we were trying to find some way out of the predicament the parish priest was announced and the superintendent asked me to remain during the interval, divining that it had something to do with the Burke case.

The reverend gentlemen was really sincere. Mrs. Burke had begged him to intervene; she had taken in washing to clothe the children and keep them in school; her husband gave them, out of each month's wages, only enough to pay the rent and a part of the grocery bills. Since he had been discharged Burke had been morose and disagreeable, taunting the family concerning their religion, and telling the wife if the priest did not do something for him quickly he would move them all to Mexico or Alaska; in fact, had commenced selling some of the household goods, ostensibly for this purpose, but quite likely to obtain whisky. The girls were bright and quick, as were the boys, and Father Parde was quite sure if the family could be kept together for a year or two longer they would be able to support themselves.

Burke, of course, promised him to let liquor alone, and while the priest did not have much confidence in his keeping such promise he would consider it a personal favor if we would overlook the offense this time.

Well, Bill went back on his engine, and all the crews were working at 9 a.m., much to the relief of the traffic department, who stood to lose some competitive business they had just secured.

A few weeks after this one of the switch engines struck a street car, causing a fatality, and the coroner's jury brought in a verdict censuring the officials, as it was indirectly testified to that there was only one ground man on the engine. The accident occurred near the brewery. I was glad it was not Burke's engine.

As these events, with their kaleidoscopic combinations, presented themselves to my experience, I began to wonder less why the American railways had more accidents than those of other countries. It came back to me repeatedly that which my father had told me of the impatience of the British public with mistakes, and how careful he had been to always drive his engine with absolute control, as against avoidable accidents. He had finally met with misadventure, the solution of which required the combined mental efforts of the "guinea pigs," as the managing directors are called (for the reason, as he explained, that they received a guinea for each meeting, which, in the opinion of the thrifty Scot, were a bit too frequent). He lost his position and migrated to America, where, fortunately, as a machinist he was able to secure employment. He never drank, smoked or indulged in any habits that affected his mental alertness, nor did he grieve over his dismissal as much, perhaps, as would have been the case had it occurred later in his experience. I had often heard him say, as he examined the work reports in the roundhouse, or observed some of the shortcomings of our engineers: "Aye, well, lad, dinna ye ape them, the' 'ill mind the rolls bitter wen the coontrey ages a wee bit." * * *

We have departmental organization, so that I am busy accumulating information for the superintendent as to the weakness of the power, which, I understand, he uses to combat the mechanical superintendent, who attributes the engine failures to sidetrack delays. These are generally furnished him by the road foreman of engines, who reports to him direct. We are able in this way to shift a great deal of our responsibilities back and forth. Sometimes we get friendly and put it on to the coal in the winter and on to the maintenance of way department in the summer, when they are doing much new work. The engineering department is in charge of the track, so that the superintendent quite readily accepts the latter explanation, but at the top, I gather from occasional rumblings, it creates friction. If it would give us smoother track this would be immaterial, but it doesn't.

I have gained experience in the last year. The first year required a little more effort than usual on the part of those I am supposed to supervise in bringing *me* to the proper state of discipline. I know the chairmen of all the committees, their strong and weak points. I am more crafty in getting together my cases calling for discipline. The longer I study the standard code the more I become impressed with its ingenuity. It is like the Koran, in that I can find something between its mystic covers that will convict anyone subject to its government, of any offense, if I can prove he was in that vicinity when the incident occurred. Likewise the chairman of the accused man's committee, by the same token will show that I am wrong; he will nail this down by precedents, or prove that I myself saw a violation of the rule and took no action, which naturally led the men to understand that it was a sort of dead one.

In this way we go around watching each other for an opening, in a sort of sparring match, figuratively speaking—careful, both of us, to keep within our rights, for fear of reversal. The men applaud or criticize their champion as his work seems to merit. He dislikes to lose a case as much as I. He has an advantage, being on the defensive, and I am often compelled to overlook infractions of good practice, if not of rules, on account of not sufficient evidence to make my case impregnable. As the chairman are all paid a salary they are, of course, expected to overlook nothing of interest to their clients.

Instead of an irresistible impulse to obey and do the right, there is a marked and growing tendency among the men to take up all the slack and to obtain as much as possible in return for the special assessments and heavy dues. In fact, a great many men could not be held in the brotherhoods except for the understanding that the money thus expended is an assurance against discipline.

Being on a transcontinental line, I have some good opportunities to talk with railway officials passing over our line. I am always much interested in those from foreign countries.

From them I learn that the inherent disposition to obey is of great assistance in managing their properties, as well as their ability, on all occasions to command expert substitutes. * * *

Coming so recently from the ranks I am quite familiar with the caboose stove talk, and that of the lodge room, the roundhouse and the switch shanty. Do not railway officials know that 90 per cent. of the intellectual effort of those who have to do with the operation of the trains and engines is along the lines of "shoving it off on the other fellow?" The train despatcher and the train and enginemen occupy the same relative positions as those of the cat and the dog in the animal world! I am kept fairly busy lubricating the friction. The telephone despatching has taken some of the burden off my shoulders in this respect. Now, when Jones wants to run the stock cars at Van Dike the despatcher calls him to the 'phone and in a conciliatory tone of voice (which could not have been transmitted by Morse) informs him that no partiality is intended; unless the cars can be got to Kokomo by 4 p.m., he explains, the G. T. Q. will get the shipment; engine No. 56, following is on one side, and when No. 58 ahead passed, the order had not been placed. The apology is generally accepted, and the cars are picked up without knocking in a drawhead.

There is another thing about the telephone that pleases me. I carry a pocket receiver and plug in at any of the stations, where I can listen to the train orders and other business pertaining to the movement of traffic, often picking up information of value, and thereby acquiring a closer insight into what is going on. This makes up for my deficiency in telegraphy, which I had previously felt keenly.

I am going to make some despatchers out of conductors. I have one or two carrying the receivers now to ascertain if they are likely to develop the train-moving knack. They ought to be a valuable acquisition to the office. From them telegraphers can absorb practical information as to the things usually out of their mental horizon.

If I can now discover a way of curing the misconstruction of rules and bulletins, lessen the side-stepping and acrobatic mentality by which they are twisted into diametrically opposite viewpoints, depending upon whose ox is gored, I shall feel that I am making progress.

The disposition of the men to obey is regulated to a great extent by the law of supply and demand. Jobs are just now hard to get, and my time is less taken up with the discipline—the most important, complex, perplexing, unsatisfactory and disagreeable duty I have to perform.

I find the despatchers hard-working, loyal and ambitious. There is an inclination on their part to push things along by verbal instructions or messages, which I find must be absolutely restricted to the "19" or "31" orders, so that there shall be no loophole in case of accident.

The 16-hour law bothers everyone. This, with the 28-hour law, the safety appliance act, the quarantine law, the full crew law, and a dozen or so others, keep the despatchers in a fret, and all of us busy explaining. There are 243 laws, state, municipal and federal, that have to do with my duties directly and indirectly, to say nothing of the laws of the organizations, some of which have assumed the proportions of "Compiled Statutes." I bump into I. C. C. inspectors, dodge those of the Agricultural department, and am interviewed by representatives of the Department of Justice. Men representing the state railway commissions are becoming more common, and the pure food inspectors, marshals, sheriffs and smaller fry are everywhere aroused to the necessity of regulating the railways. We make numerous and prodigious reports to nearly all of them, and then are called upon to explain this, that or the other, which, to the layman, appears incongruous; but, after painstaking effort to show that the incident was unavoidable, our explanation is generally accepted.

A considerable part of my time is employed in obtaining evidence to defend the company from prospective judicial harassments, the most of which never materialize. It takes too much expert and valuable time from supervision and amounts to little, from a corrective standpoint.

If I keep out of jail and my home is not absorbed in a fine some unlucky day, I am going to Russia for a month or two next year, where I can fill my lungs with some comparatively free air.

If I were asked to deduct from my experience the best practice, and that which would enable a trainmaster to render through those with whom he is directly connected, the highest grade of efficiency, I would unhesitatingly say: "Eliminate from the standard code rules those that are ambiguous or manifestly placed there solely to enable the railway to shift its responsibilities." In administering discipline, first and above all, apply the Golden Rule. The man at fault should be diligently and intelligently sought out and his responsibility definitely and irrevocably fixed, confining it, ordinarily, to one individual and seldom to more than one crew. Hold the conductor for the acts of his brakemen and the engineer for the fireman, but give them the necessary authority to enforce obedience. Gently but firmly push back all sympathetic, social, political or religious interference. Let the officials who employ the men apply the discipline and then refrain from criticism or reversals. They may make mistakes, but not nearly so many as will be made by those further removed from the cause and effect. * * * Abolish un-American principles, relegating the spies to barbarism and despotic forms of government. Cultivate a high sense of honor in both officials and men. This is priceless, but has been partially destroyed by nagging and unwarranted interference.

THE TRAIN FERRY BETWEEN GERMANY AND SWEDEN.

A joint railway train ferry service was started on July 7 between Sassnitz, Germany, and Trelleborg, Sweden, by the German and Swedish governments. The distance across the Baltic between these points is 65 miles, and at times heavy seas are encountered. The "Drottinning Victoria," which is typical of the other ferries, was recently delivered to the Swedish government by Swan, Hunter & Wigham Richardson, Ltd., of the Neptune Ship Yard, Walker-on-Tyne, England. The following table gives some of the dimensions of this boat:

Displacement, tons	4,270
Rated horse-power	440
Maximum speed in knots, per hour	16½
Length over all	370 ft.
Width over all	53 ft. 6 in.
Draft, loaded	16 ft. 6 in.
Deadweight capacity	600 tons

The boat has deep bilge keels and is fitted with triple expansion engines. She makes the 65-mile trip between Sassnitz and Trelleborg in four hours, and is built to accommodate a train of eight cars. The car deck is laid with two parallel lines of heavy rails, each line being 295 ft. long. The ferry docks at a slip built of stone piers, lined with wooden piles, which are connected with the stone by iron spring buffers. The slip is built so that the boat exactly fits about half of her length into it. The connecting link between the land and the boat is made by a steel bridge 160 ft. long, hinged at the other end and at the middle. While lying at the slip the boat is fastened to the outer end of the bridge by a large steel bolt.

When on the ferry the cars are screwed to gun metal shackle plates, which project from the deck on the outside of the cars and from the wall on the inside of the cars. The cars are jacked up so as to relieve all pressure from the car springs, and in heavy seas the top of the car may be bolted to the sides of the vessel. The car deck is built to accommodate cars 15 ft. 3 in. high and 11 ft. 3 in. wide. This is the maximum loading dimensions of cars on Prussian and Swedish state railways.

The rails are laid in channels and fastened by cast-steel chocks and are not riveted to the deck.

Beside being a car ferry the boat is fitted as a first-class

passenger steamer, having dining room, saloon, smoking room and sleeping accommodations for 96 first-class and 45 third-class passengers. The first-class passenger accommodations consist of 10 two-berth staterooms, each 7 ft. square and 19 four-berth staterooms, measuring 7 ft. x 9 ft. There are also two large apartments measuring 34 ft. 4 in. x 14 ft. each, having 14 iron beds and eight sofa berths. These staterooms are on the deck below the one on which the cars stand, and on the deck above the car deck there is the first-class dining saloon, smoking room, promenade, etc.

The furnishing of the cabins and saloons is first-class throughout and fully as elaborate as what one would expect to find on a first-class passenger steamer. The vessel is electric lighted, each sleeping berth having a 16-c.p. light, which may be switched down to 2 c.p., and the corridors and car deck are brilliantly lighted. The cars may be coupled to steam pipes of the vessel, thus providing for heating while on the boat.

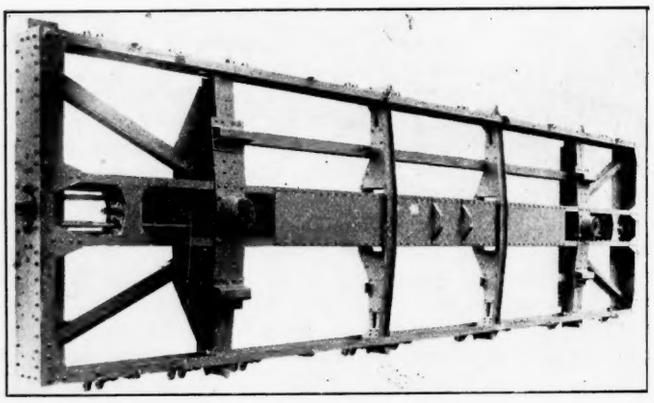
STEEL UNDERFRAME CARS FOR EXPORT.

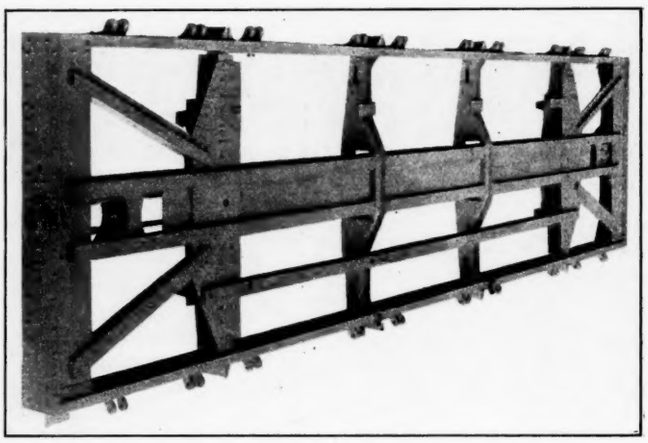
During the past year or more the Middletown Car Works have built a number of cars for export. Among the roads to which deliveries have been made are: The Nipe Bay Co., of Cuba; the Northern Central, of Argentina; the Parral & Durango, of Mexico; the Canton-Hankow, of China, and the Central of Argentine. These cars were for freight service and from among them illustrations are given of some for the Canton-Hankow (Yueh-Han) and the Central of Argentine.

The cars were built with the King steel underframe, which is formed of a box center girder made up of two 10-in. channels weighing 20 lbs. to the foot, with ¼ in. top and bottom cover plates closely riveted to the channel flanges. The body bolsters are of the built-up type with ¼-in. webs and top cover plates ¼ in. thick and 20 in. wide. The bottom covers are ⅜ in. thick and 12 in. wide. All of these parts are strongly riveted to web flange angles and center sills, with ⅜-in. side sill connections.

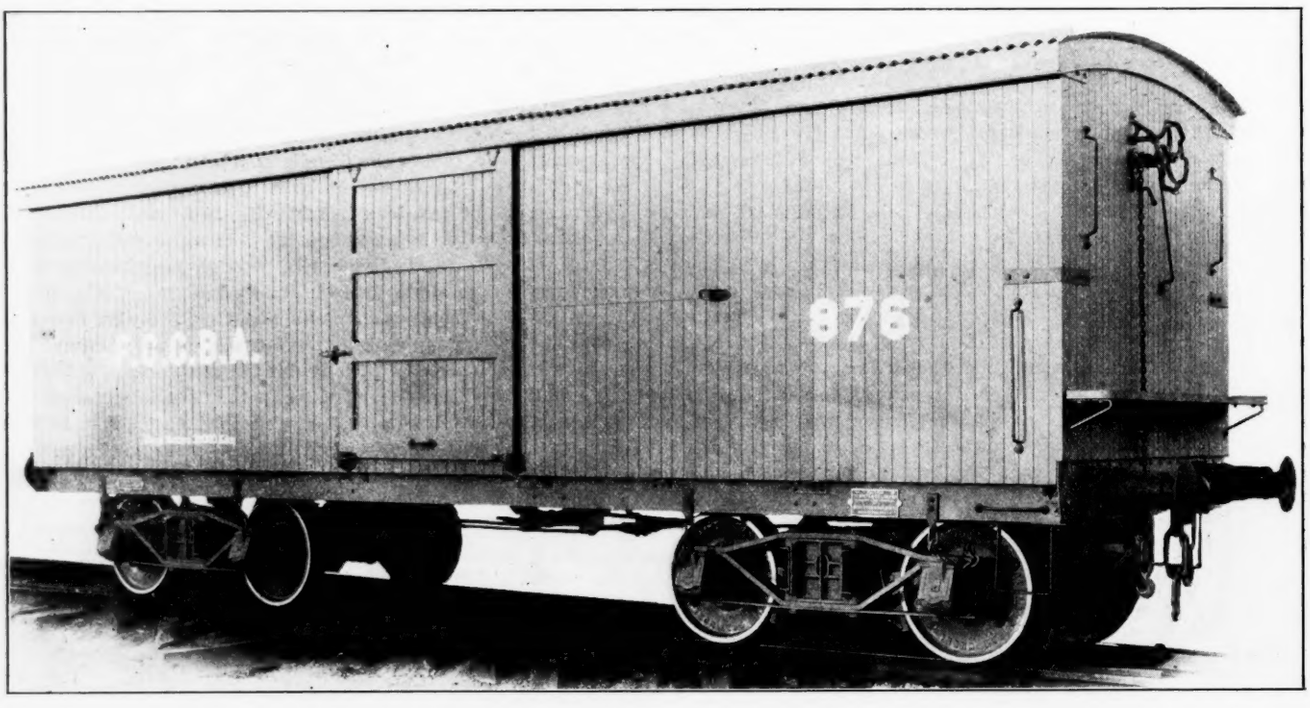
In addition to the bolsters there are two cantilever floor beams made up of one top tension member extending from side sill to side sill and resting on the top of the center girder to which it is riveted. They also have bottom compression members that are riveted in the same manner to the bottom of the box girder. Both the tension and compression members are of 6 in. channels.

The end sills are ⅜ in. plates riveted to top and bottom





Upper and Lower Side of Underframe for 30-Ton Gondola for the Buenos Aires Central.



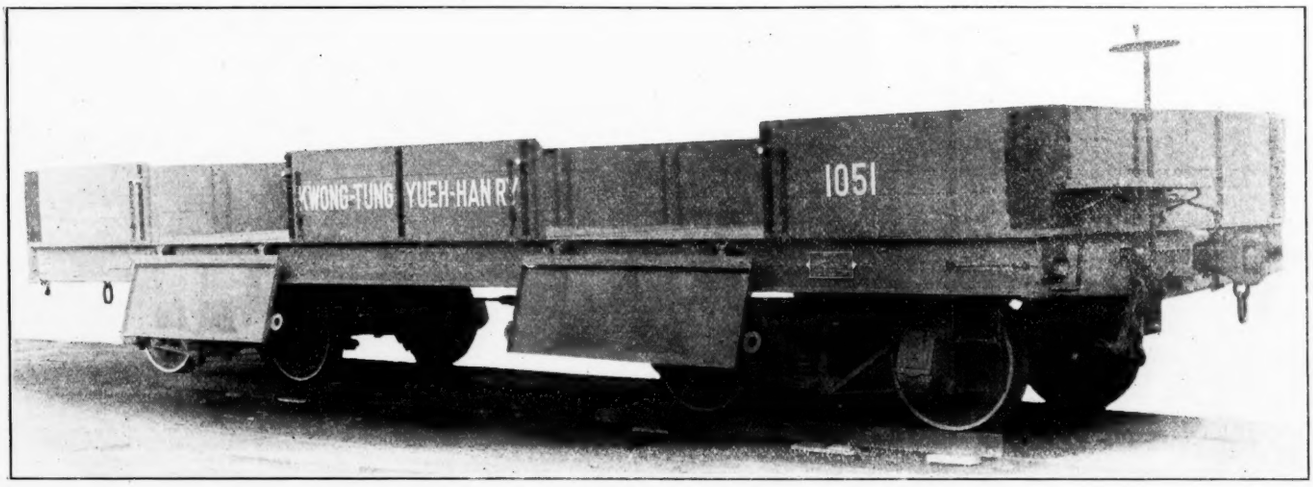
30-Ton Car for the Buenos Aires Central Railway.

covers by means of angles and having the corners braced with diagonal braces of $3\frac{1}{16}$ in. x 4 in. x $3\frac{1}{16}$ in. Z bars with ¼ in. webs. These are riveted to the top cover plate of the bolster and the subsill plate.

In the case of the cars for the Central of Argentina, the draft rigging is of the European type where the hook and chain is used with side buffers. In this there is a single draft spring at the back end of the coupler shank to which a continuous rod is attached running to the other gear so that the car body is relieved of the draft stresses. On the Canton-Hankow cars, on the other hand, the M. C. B. coupler with the Republic draft gear is used. This is perhaps one of the advantages that China has reaped by coming into the railway field late in life, that it has escaped the ills of a very faulty coupling gear and the long period of transition that other countries have fallen heir to.

The trucks that are used under these cars are of the American diamond type and offer no peculiarities of construction outside the regular designs of cars used throughout the United States.

The cars shown for the Canton-Hankow were of the low-side gondola class but those for the Argentine Central also included the box car while for the other roads mentioned there were cane and timber cars as well.



30-Ton Car for Yueh-Han Railway.

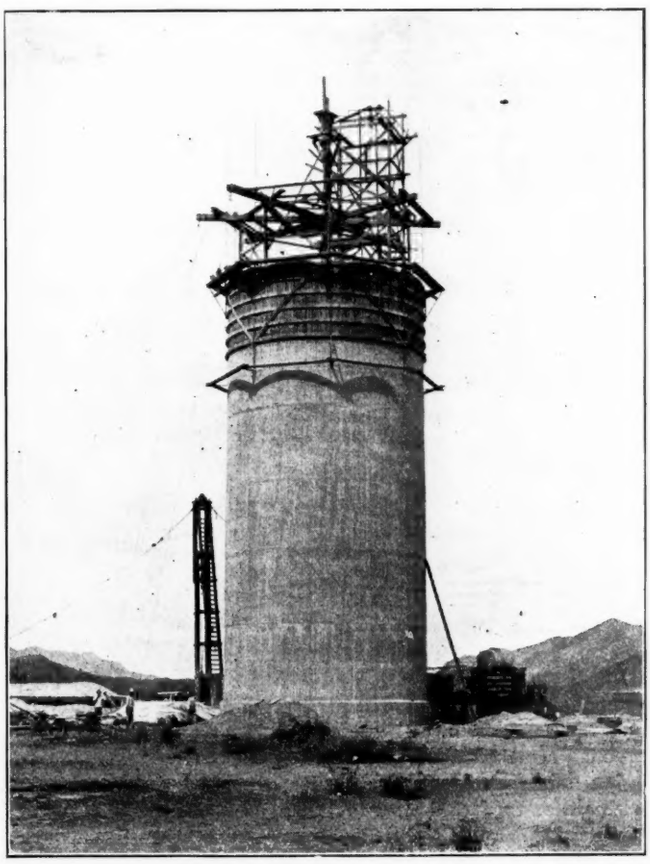
REINFORCED CONCRETE WATER TANK IN MEXICO.

The Cananea, Yaqui River & Pacific, which is a part of the Southern Pacific Company's Mexican system, recently completed at Empalme, Sonora, a reinforced concrete water tank 30 ft. in diameter, inside, and 90 ft. high. Drawings and a photograph taken before completion are shown herewith.

The foundation, which is octagonal in plan, 38 ft. in diameter the short way and 5 ft. 3 in. deep, rests on 97 Simplex (Henry Shuman, Philadelphia, Pa.) concrete piles spaced 3 ft. 6 in. on centers. The shell or tower is 10 in. thick at the bottom and tapers to half this thickness at the top. At the juncture of shell and floor the former is thickened to 18 in. for a height of 4 ft., a detail of this connection being shown in the drawings.

The tower is reinforced horizontally and vertically with corrugated bars. The vertical rods are ½ in. square, set staggered, in two circles and spaced 10½ in. apart, there being 55 rods in each circle. The two circles are 2½ in. apart at the bottom and 2 in. at the top, the outer row stopping 14 ft. 4 in. from the top of the tank. The horizontal bars range from ¾ in. square in the first 30 ft. of height to ⅜ in. in the top 16 ft., the second section, 22 ft. high, having ⅝-in. bars and the third section, of 29 ft., having ½-in. bars. In each section the bar spacing decreases upward in zones of varying widths, the 30-ft. section of ¾-in. bars, for example, having the spacing 2⅜ in. in the bottom 3 ft., 2½ in. in the next 8 ft., 2¾ in. for the next 7 ft., 3 in. for the next 5 ft. and 3¼ in. for the remaining 7 ft. The horizontal bars are in two concentric rows corresponding to the vertical rods, the outer row stopping 16 ft. from the top of the tower. The floor of the tank—a 9-in. layer of concrete over the foundation slab—is reinforced with ¼-in. rods laid both directions 8 in. on centers.

A detail of the construction at the manhole is shown. A 10-in., 40-lb. I-beam, 6 ft. 6 in. long, is embedded in the founda-

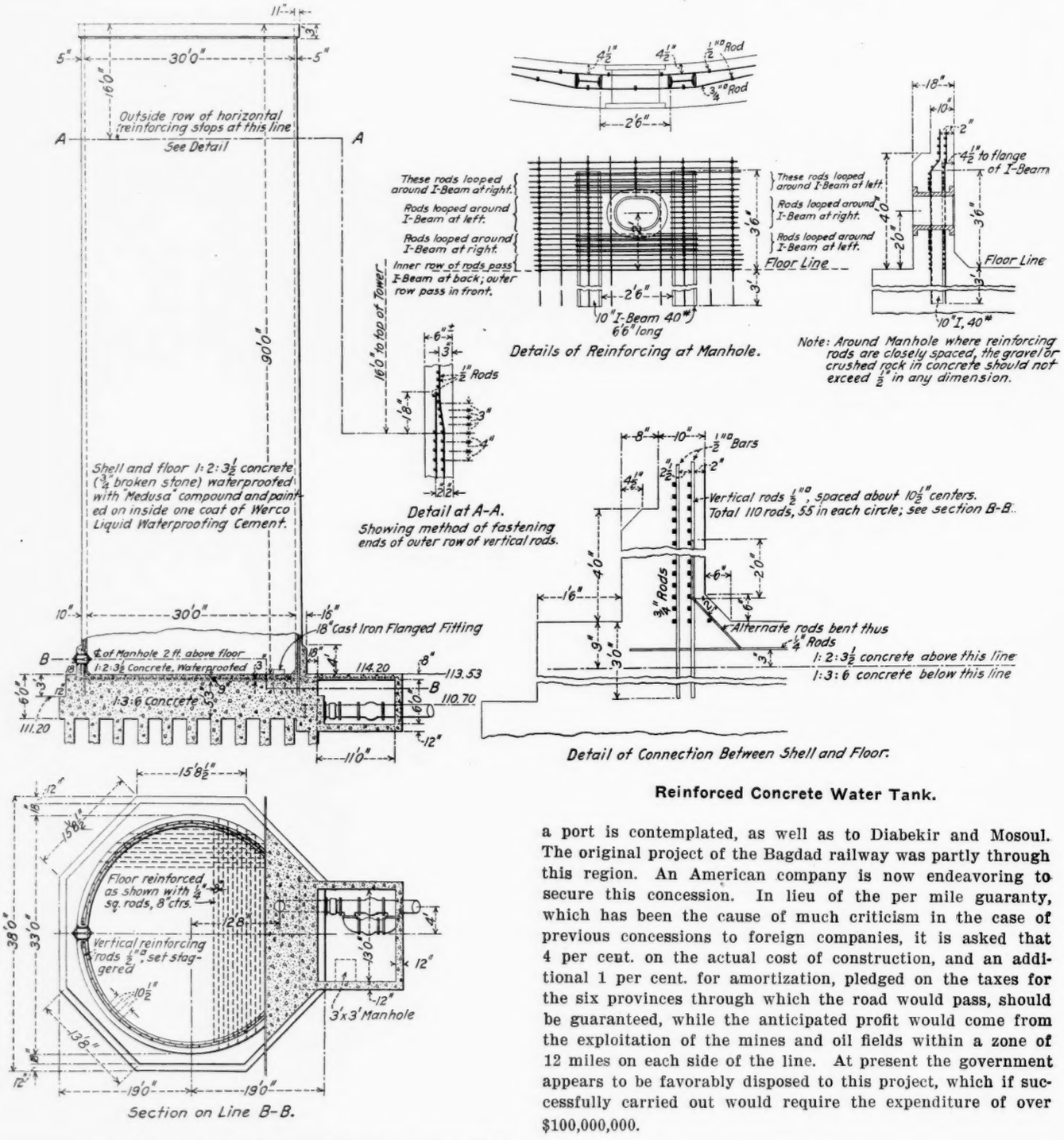


Tank Under Construction.

tion and wall each side of the manhole. The rods about the manhole are looped around the beams as shown in the detail, the inner row of horizontal rods passing back of the beams and the outer row in front.

The shell and floor of the tank are formed of 1:2:3½ concrete with ¾-in. broken stone, while the foundation is 1:3:6 concrete. The shell and floor are waterproofed with Medusa compound (Sandusky Portland Cement Co., Sandusky, Ohio), and the inside painted with one coat of Werco liquid waterproofing cement (Western Elaterite Roofing Co., Denver, Colo.).

The tank, which has a capacity of 480,000 gals., was filled with water to within 4 ft. of the top and this level has been maintained. During the first three weeks there was considerable sweating, but since that time the tank has been perfectly dry.


Outside row of horizontal reinforcing stops at this line
See Detail
Shell and floor 1:2:3½ concrete (¾" broken stone) waterproofed with "Medusa" compound and painted on inside one coat of Werco Liquid Waterproofing Cement.
1:3:6 Concrete
18" Cast Iron Flanged Fitting
℄ of Manhole 2 ft. above floor
1:2:3½ Concrete, Waterproofed
Floor reinforced as shown with ¼" sq. rods, 8" ctrs.
Vertical reinforcing rods ½" ø, set staggered
3'x3' Manhole
Section on Line B-B.
These rods looped around I-Beam at right.
Rods looped around I-Beam at left.
Rods looped around I-Beam at right.
Inner row of rods pass I-Beam at back; outer row pass in front.
Floor Line
10" I-Beam 40#
6'6" long
Details of Reinforcing at Manhole.
½" Rods
Detail at A-A.
Showing method of fastening ends of outer row of vertical rods.
Vertical rods ½" ø, spaced about 10½" centers.
Total 110 rods, 55 in each circle; see section B-B.
¾" Rods
¼" Rods
Alternate rods bent thus
1:2:3½ concrete above this line
1:3:6 concrete below this line
Detail of Connection Between Shell and Floor.
Note: Around Manhole where reinforcing rods are closely spaced, the gravel or crushed rock in concrete should not exceed 2" in any dimension.

Reinforced Concrete Water Tank.

FOREIGN RAILWAY NOTES.

The minister of public works of Turkey, in a programme recently published, was anxious for a road to be built through the central portion of Asia Minor, from Angora, where the (German) Anatolian railway now stops, to Van, via Sivas and Harpoot, with transverse branches to the Mediterranean, where a port is contemplated, as well as to Diabekir and Mosoul. The original project of the Bagdad railway was partly through this region. An American company is now endeavoring to secure this concession. In lieu of the per mile guaranty, which has been the cause of much criticism in the case of previous concessions to foreign companies, it is asked that 4 per cent. on the actual cost of construction, and an additional 1 per cent. for amortization, pledged on the taxes for the six provinces through which the road would pass, should be guaranteed, while the anticipated profit would come from the exploitation of the mines and oil fields within a zone of 12 miles on each side of the line. At present the government appears to be favorably disposed to this project, which if successfully carried out would require the expenditure of over $100,000,000.

The concession for a railway from the bay of Camarones, Chile, to the Bolivian frontier, previously given to Salvador Izquierdo, Ramiro Sanches and Rodolfo Rothstein and afterward withdrawn, has been transferred to the Comunidad Chilcaya y Ferrocarril de Camarones. This company has asked the Bolivian government for a concession for a railway from Chilcaya to Oruro.

General News Section.

A local branch of the American Railroad Employees' and Investors' Association was organized at New Orleans on September 1, and 102 applications for membership were filed at the first meeting.

The foreclosure sale of the property of the Metropolitan Steamship Company will be held on October 8 at Boston, Mass. It is reported that Charles W. Morse, who has been buying up the claims against the company, will bid in the property.

It is reported that the Sunset-Central lines of the Southern Pacific Company are planning to discontinue entirely the use of oil as fuel in freight engines in Texas and Louisiana, due to the decrease in the supply of fuel oil. Passenger locomotives will still continue to use oil as fuel, probably on account of the advantage of freedom from smoke.

The Hine system of organization has been extended to the Oregon & Washington, which is a subsidiary of the Oregon Railroad & Navigation Co. The use of the titles of chief engineer and of purchasing agent have been discontinued. D. W. Campbell, assistant general manager, retains that title. J. R. Holman, chief engineer, has been appointed an assistant general manager; G. W. Saul, purchasing agent, has been appointed an assistant general manager, and J. L. Brass has been appointed an assistant general manager.

New Ocean Records.

The Cunard steamship "Mauretania," which sailed from New York on Wednesday, August 25, called at Fishguard, South Wales, on Monday, August 30, and passengers for London reached that city in 5 days, 9 hours, 22 minutes from the time they left the dock at New York. The run by special train over the Great Western Railway from Fishguard to London, 262 miles, was made in 4 hours, 30 minutes. The "Mauretania" made the best record across the ocean up to that day, the time of the passage from Sandy Hook lightship to Daunt's Rock being 4 days, 14 hours, 27 minutes.

The Cunard steamship "Lusitania," on her last westward trip, left Liverpool Saturday evening, August 28, and landed her passengers in New York before 8 o'clock on Thursday evening, September 2, thus beating all records across the Atlantic ocean, and for the first time landing passengers in New York on the fifth day from Liverpool. The vessel arrived at Ambrose channel lightship at 4:42 p.m., or in 4 days, 11 hours, 42 minutes from Daunt's Rock. The average speed was 25.85 knots an hour, or a hundredth of a knot better than the time of the "Mauretania" reported above, and the record, it will be seen, was 2¾ hours better. New propellers were fitted to the "Lusitania" a few weeks ago, two four-blade brass on the high-pressure shafts and two three-blade manganese on the low-pressure shafts. According to the newspapers, the coal consumed by the "Lusitania" on this trip amounted to 4,725 tons.

Indiana Laws.

The Indiana Railroad Commission has sent out a circular calling attention to the recently enacted law providing that after January 1, 1910, engines used exclusively for switching shall be uniformly equipped with footboards on the front and rear ends; headlights at both ends, and grab irons on both ends.

The commission has also issued a circular calling attention to the recently enacted law (similar to the federal law) providing that from January 1, 1910, locomotive ash pans must be cleanable without the necessity of any employee going under the locomotive. The law makes it the duty of the commission to enforce this law, and the penalty for violation is from $200 to $400.

The commission has also issued a circular calling attention to a recent law requiring all locomotives to have automatic bell ringers.

The commission has again called the attention of all steam and electric railways to highway crossing accidents, caused, in part, by the obstruction of view along the railway by trees, bushes and weeds. All such obstructions should be cut down, and land owners should be induced to co-operate.

Harriman, Ripley and Yoakum.

A recent admirable editorial appreciation in the Chicago *Tribune* of the extraordinary volume of values which the service of western railways has created in the sections which they penetrate, directs attention to those constructive statesmen who have accomplished these prodigies. * * * Mr. Harriman is now connecting the northernmost extremity of the Pacific coast with the Gulf of Mexico and furnishing both with access to eastern markets. Mr. Ripley, the directing head of the Santa Fe, has created a new empire in the great Southwest. Mr. Yoakum, of the Rock Island, who is himself a constructive genius and an up-builder of colonies, put 40,000 people into Oklahoma within a single year, and in that marvelously fertile strip of alluvial land along the Texas coast of the Gulf of Mexico has settled other thousands. Henry Flagler has created a new Riviera in Florida and soon will place our railway trains within a mere 90-mile ferriage of Cuba's capital.—*St. Louis Times.*

Art at Salt Lake City.

The new union station of the Oregon Short Line in Salt Lake City, when completed, will have two panels containing large mural paintings. One will illustrate the entrance of the pioneers into the Salt Lake valley in 1847, and the other the driving of the golden spike at Promontory Point in 1869.

The five big windows in the upper part of the waiting room on the west side will be of cut glass. The first one will show the monarch of the plains, a magnificent picture of a buffalo; the second, a pioneer stage coach; the third, and center one, the Lucin cut-off across Great Salt Lake, with a train on the trestle; the fourth, a view of Great Salt Lake, and the fifth, a smelter, typical of the mining industry of Utah.—*Exchange.*

Objects to Roll-Top Desks.

Western newspapers say that when President Cotter, of the Cincinnati, Hamilton & Dayton, walked into his Cincinnati office last week his first job was to order out the handsome mahogany desk used by Governor Harmon and have a plain flat-top desk brought in for himself. He gave a hint that the same action was to be taken by other officers. Mr. Cotter is quoted as saying that he does not like roll-top desks. They are the easiest thing in the world for a man to hide some of to-day's work in and then sneak it out and do it to-morrow. Mr. Cotter also says his policy will be to give out full details of any accidents rather than to try to suppress the facts.

Signal Appliance Association.

The Signal Appliance Association, R. A. Paterson, chairman, and H. M. Buck, secretary, has issued a circular giving the programme for the annual meeting to be held at Louisville, October 12, 13, 14, which has already been announced. Applications for space for exhibits should be made to E. M. Deems, 90 West street, New York City, and, beginning September 15, assignments of space will be made in the order of the receipt of applications. The exhibits will be shown on the top floor of the Seelbach hotel. In this story the height of the ceiling is 15 ft. The capacity of the elevator is 2,500 lbs., and

its size is 4 ft. 3 in. wide, 5 ft. 9 in. long and 10 ft. high. For hotel reservations application should be made direct to the hotel. The Seelbach is conducted on the European plan and the Louisville hotel on the American plan.

The Appliance association, which provides entertainment for members of the Signal association and guests, has arranged to show the ladies around the city on Tuesday afternoon, and will provide an entertainment for them Wednesday forenoon. There will be a dance on Tuesday evening and a banquet Wednesday evening. As before announced, it is proposed to have an excursion on Friday to Mammoth cave.

New York Railroad Club.

The next regular meeting will be held on September 17. Frederick C. Syze, trainmaster of the Baltimore & Ohio, will present a paper on Surprise and Efficiency Tests of Employees Charged with the Operation of Trains.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa. June, 1910; Niagara Falls, Ont.
American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Penna. Co., Toledo, Ohio.
American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
American Railway Association.—W. F. Allen, 24 Park Place, New York, Nov. 17; Chicago.
American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago. March 14-17, 1910; Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Bldg., Chicago.
American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; annual, Dec. 7-10; New York.
American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York; Oct. 4-8; Denver, Colo.
Association of American Railway Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago. June 29, 1910; Colorado Springs.
Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May; Nashville, Tenn.
Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago. May 16-20, 1910; Los Angeles.
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, N. Y. Dec. 14-15; Chattanooga.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va. June 15, 1910, California.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York.
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month; except July and August; Des Moines
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month; except June, July and August; Pittsburgh.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; Oct. 12-14; Louisville, Ky.
Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Sept. 14-17; Washington.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Society of Railway Financial Officers.—C. Norquist, Chicago.
Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La. Oct. 21; Birmingham, Ala.
Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.; September, 1909; Denver.
Western Canada Railway Club.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Mon., ex. June, July and Aug.; Winnipeg.
Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

It is reported that the Texas City Steamship Company is considering the establishment of a weekly coastwise service between Texas ports and New Orleans.

The Spokane, Portland & Seattle has announced traffic arrangements with the North Pacific Coast Steamship Company, effective September 25, providing for through ticketing arrangements from points on its line to Eureka, San Francisco and San Pedro, Cal. Tariffs effective the same date have also been filed providing for through ticketing arrangements with the Southern Pacific from all points on the Spokane, Portland & Seattle to all points on the Southern Pacific, providing a choice of either an all rail route going or returning and an ocean trip from Portland.

Official announcement is said to have been made from the San Francisco office of the Wells-Fargo Express Company of a contract entered into with the Mexican government, by which this company will control practically the entire express business between the southern boundary of the United States and the republic of Guatemala. A new company, under the name of the Compania Mexicana de Express has been organized to conduct the business, and it is understood that the stock in this company is to be largely held by the Government, as is the case with the National railways.

Advance sheets of the fortnightly bulletin of the committee on relations between railways of the American Railway Association, which is due September 10, indicate that on September 1 the total of surplus cars reported was only slightly over 100,000. This represents a reduction of over 40,000 from the figures shown in the statement for August 18. On that date the surplus was 159,424, a decrease of nearly 50,000 over the previous report. On August 18 the total of surplus box cars was 80,000. Arthur Hale, chairman of the committee, estimated that on September 1 the total surplus of box cars was about 60,000, and that of this surplus the greater number were in Illinois, Iowa and the Dakotas awaiting the movement of crops. In the advance report Mr. Hale says: "It is important to note that this season's reduction in car surpluses is six weeks ahead of last year's figures. This indicates that shortages this year will be greater than a year ago. Increasing industrial, agricultural and mining activity is responsible for this early reduction."

All indications point to a general "speed war" between the western railways as a result of changes announced by the Hill lines. These roads have made a proposition to the postal department to put a fast mail train in service between Chicago and Seattle, to run through in 62 hours. This will be a reduction of 10 hours from the fastest time now made. The Burlington has also given notice that, from September 12, it will no longer observe the arrangement (of two years' standing) for the limitation of the speed of passenger trains, and that it will reduce the running time of its Chicago-Denver train by two hours. This will be a restoration of the time made by this train previous to the agreement. The Santa Fe has also made a similar proposition to the postal department to put on a new mail and express train from Kansas City to Los Angeles that will reduce the present running time by 10 hours, or from 60 hours to 50 hours. The North Western and the Union Pacific have announced their intention of meeting the cut in time to Denver, and the Rock Island and the St. Paul are said to be considering a similar step. The North Western has put on a train between Chicago and St. Paul which covers the distance in 1 hour and 20 minutes less time than the North Western Limited. Time-card meetings are to be held shortly by the Rock Island and the Southern Pacific, and it is understood that the Southern Pacific is making arrangements to meet the cut in time between Kansas City and Los Angeles by way of El Paso if the occasion requires. It is also understood that the St. Paul stands ready to put on a through train by January 1 over its new line between Chicago and Seattle by way of St. Paul to make the distance in 62 hours, the time offered by the Burlington. No dates have been set for carrying out any of these proposals, except that mentioned in connection with the Burlington's Denver train.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JUNE, 1909.
(See also issues of Aug. 6, 13, 20, 27, and Sept. 3.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance Way and structures.	Maintenance Of equipment.	Traffic.	Transportation.	General.	Total.					
Atlanta & West Point	93	$33,533	$31,764	$71,452	$5,572	$17,765	$5,758	$25,122	$4,628	$58,845	$12,607	$191	$4,517	$8,281	‡$5,184
Central Vermont	411	194,450	82,683	295,239	45,213	(a)14,462	7,833	116,388	7,176	162,147	133,092	913	478	133,527	‡17,723
Chicago & Erie	269	249,440	75,044	360,096	33,236	78,553	15,171	160,292	10,305	297,557	62,539	.....	10,765	51,774	56,836
Chicago, Milwaukee & Gary	123	22,642	94	23,480	6,159	4,261	1,225	9,132	1,282	22,059	1,421	.....	1,666	245†	2,624
Erie	1,901	2,762,277	703,387	3,752,454	239,991	737,282	89,778	1,123,867	101,504	2,291,422	1,461,032	36,086	103,309	1,393,809	$34,075
Georgia	307	109,610	58,877	179,240	(a)16,244	33,486	9,278	99,084	9,102	134,706	44,534	.....	1,071	43,463	42,663
Georgia & Florida	254	18,394	10,956	31,154	4,074	6,259	1,580	12,170	3,721	27,804	3,350	.....	1,370	1,980	7,507
Georgia, Florida & Alabama	168	12,377	10,848	27,085	4,925	5,249	1,024	12,655	4,589	28,442	1,357*	.....	1,560	2,917†	‡4,956
Green Bay & Western	225	27,205	16,076	48,378	8,480	7,197	702	13,462	1,895	31,736	16,642	.....	3,086	13,556	‡2,413
Kansas City, Clinton & Springfield	154	14,891	9,852	29,010	4,905	1,053	485	9,453	1,597	17,493	11,517	.....	2,000	9,517	2,572
Kansas City, Mexico & Orient	259	51,741	15,244	69,988	15,839	25,364	2,947	30,644	4,676	79,470	9,482*	.....	3,500	12,982†	‡28,813
Kansas City, Mexico & Orient of Tex.	174	25,371	9,445	36,399	8,181	3,594	915	19,442	1,972	34,104	2,295	.....	1,250	1,045	3,700
Las Vegas & Tonopah	197	11,504	6,237	19,345	4,523	2,751	1,922	9,032	2,642	20,870	1,525*	122	3,564	4,967†	‡14,020
Lehigh & New England	170	79,584	2,095	82,248	19,125	7,633	926	18,667	3,587	49,938	32,310	.....	850	31,460	2,384
Manistee & North Eastern	129	29,804	6,745	38,055	11,260	5,826	669	16,912	3,358	38,025	30	.....	2,363	2,333†	‡7,520
Minnesota & International	177	32,088	17,016	52,496	6,190	6,863	421	17,049	1,936	32,459	20,037	.....	2,099	17,938	8,028
Nevada-California-Oregon	184	27,450	13,294	43,286	5,410	4,031	579	7,396	1,618	19,034	24,252	.....	1,037	23,215	9,575
New York, Susquehanna & Western	151	114,075	51,214	190,372	23,078	22,155	1,908	69,396	4,486	121,023	69,349	1,548*	15,085	52,716	34,336
Richmond, Fredericksburg & Potomac	83	123,398	48,109	193,951	32,908	19,606	2,298	60,878	4,662	120,352	73,599	.....	904	72,695	5,991
Rio Grande Southern	180	29,418	9,852	42,901	12,754	3,773	106	14,332	1,406	32,371	10,530	.....	2,074	8,456	‡12,925
Spokane & Inland Empire	168	34,957	58,599	103,534	15,790	10,276	2,508	25,542	5,588	59,704	43,830	15,441	2,250	57,021	28,178
Spokane International	141	35,033	21,447	58,193	11,280	5,138	2,230	19,025	2,761	40,434	17,759	.....	1,957	15,802	‡3,241
Stephenville, No. & Sou. Texas	43	2,348	1,778	4,481	583	625	221	2,035	503	3,967	514	.....	92	422	.....
Tennessee Central	292	71,249	31,908	109,216	18,088	1,320	4,270	50,013	10,550	84,241	24,975	.....	4,200	20,775	.....
Terminal R.R. Ass'n of St. Louis	26	.....	209	189,000	31,811	15,400	565	56,198	10,666	114,640	74,360	7,842	21,000	61,202	‡37,647
Texas Mexican	162	16,291	4,826	22,918	6,149	347	402	9,719	1,472	18,089	4,829	.....	1,344	3,485	800
Texas Midland	125	25,015	9,338	37,950	7,543	6,160	1,264	13,411	2,530	30,909	7,041	.....	662	6,379	7,426
Tonopah & Goldfield	109	50,192	16,625	72,080	9,043	9,473	2,337	20,287	4,923	46,063	26,017	99*	3,968	21,950	‡28,763
Tonopah & Tidewater	181	32,848	7,436	42,917	3,390	3,125	1,868	11,485	1,373	21,241	21,676	.....	1,820	19,856	‡8,569
Union R.R. Co. of Baltimore	9	87,545	18,075	107,835	11,277	.....	186	5,286	2,075	18,824	89,011	.....	19,177	69,834	‡9,867
Union R.R. Co. of Pittsburgh	31	.....	.....	388,827	37,593	46,556	100	98,420	2,963	185,632	203,195	2,156	2,500	202,851	146,502
Washington Co.	139	22,136	14,841	40,378	7,233	4,409	368	12,102	3,856	27,968	12,410	.....	257	12,153	15,586
Western Railway of Alabama	133	39,239	31,046	77,323	14,289	17,189	5,632	28,638	4,698	70,446	6,877	209*	4,251	2,417	‡14,872
Wichita Valley	174	22,470	16,048	41,155	9,538	2,847	317	18,239	1,719	32,660	8,495	.....	1,453	7,042	‡4,467
Wisconsin Central	975	476,147	133,111	650,161	110,026	96,528	22,149	212,347	16,250	457,300	192,861	137*	28,378	164,346	30,623
Wyoming & North Western	148	15,717	8,472	25,406	6,203	981	344	14,156	427	22,111	3,295	.....	1,662	1,633	‡4,866
FISCAL YEAR ENDED JUNE 30, 1909.															
Atlanta & West Point	93	$479,070	$396,674	$964,917	$125,323	$210,659	$53,705	$325,334	$53,441	$768,462	$196,455	$2,707	$46,034	$153,128	‡$22,245
Central Vermont	411	2,273,150	959,567	3,497,274	428,081	454,793	90,007	1,605,576	86,270	2,664,727	832,547	9,129	113,653	728,023	14,644
Chicago & Erie	269	3,142,752	780,717	4,289,969	388,219	989,133	147,249	2,033,328	98,482	3,656,411	633,558	.....	133,757	499,801	265,782
Chicago, Milwaukee & Gary	123	278,324	3,964	287,940	59,681	45,835	14,211	111,365	15,955	247,047	40,893	.....	18,500	22,393	32,269
Erie	1,901	32,047,036	8,099,917	43,224,889	3,844,188	8,659,847	977,373	14,582,853	973,353	29,037,614	14,187,275	85,566	1,235,766	13,037,075	4,546,718
Georgia	307	1,867,587	716,448	2,751,094	430,385	430,568	100,925	1,181,483	87,692	2,231,053	520,041	.....	17,299	502,742	1,773
Georgia & Florida	254	250,670	119,370	390,169	58,075	63,607	16,813	125,551	40,319	304,365	85,804	.....	14,391	71,413	48,169
Georgia, Florida & Alabama	168	201,031	154,832	401,761	73,400	59,591	10,763	146,390	48,340	338,484	63,277	4,281*	18,725	40,271	‡3,467
Green Bay & Western	225	373,439	162,484	581,617	110,458	96,050	5,268	168,819	25,785	406,380	175,237	.....	25,563	149,674	‡9,283
Kansas City, Clinton & Springfield	154	188,980	116,177	332,840	72,447	33,469	5,446	120,103	18,914	250,379	82,461	.....	21,000	61,461	1,681
Kansas City, Mexico & Orient	259	613,300	160,340	811,848	230,093	309,090	27,410	353,450	37,317	957,360	145,512*	.....	34,302	179,814†	‡19,945
Kansas City, Mexico & Orient of Tex.	174	266,516	96,766	376,639	70,662	35,234	6,855	133,443	17,333	263,527	113,112	.....	9,617	103,495	70,657
Las Vegas & Tonopah	197	200,303	78,240	304,365	63,771	30,585	22,965	134,843	34,131	286,295	18,070	482*	45,069	27,481†	‡56,024
Lehigh & New England	170	746,548	17,854	777,061	152,302	97,006	10,885	209,475	36,564	506,232	270,829	.....	10,200	260,629	10,360
Manistee & North Eastern	129	333,288	82,150	438,029	68,847	66,318	7,151	140,284	20,637	303,237	134,792	.....	27,246	107,546	‡1,411
Minnesota & International	177	406,702	159,895	603,551	115,196	71,835	3,068	184,341	22,431	396,871	206,680	.....	25,372	181,308	‡41,694
Nevada-California-Oregon	184	253,199	124,156	406,668	49,331	39,772	6,778	62,350	19,580	177,811	228,857	.....	12,450	216,406	60,365
New York, Susquehanna & Western	151	1,642,680	595,670	2,530,979	254,120	264,997	18,645	914,827	50,061	1,502,650	1,028,329	9,705*	148,345	870,279	181,890
Richmond, Fredericksburg & Potomac	83	1,110,551	683,129	2,026,324	289,018	254,713	24,853	673,288	55,814	1,297,686	728,638	.....	3,104	725,533	136,444
Rio Grande Southern	180	426,392	111,128	576,151	124,024	42,017	1,489	191,813	19,448	378,791	197,360	.....	28,074	169,286	‡33,684
Spokane & Inland Empire	168	325,020	501,982	881,710	115,751	79,850	23,669	292,733	72,906	584,909	296,801	113,948	23,800	386,949	74,924
Spokane International	141	471,212	211,586	701,509	135,868	57,269	22,909	236,786	30,703	483,535	217,974	.....	22,250	195,724	45,088
Stephenville, No. & Sou. Texas	43	80,464	18,253	102,859	8,109	11,079	2,280	29,085	6,963	57,516	45,343	.....	1,292	44,051	.....
Tennessee Central	292	881,997	358,473	1,316,396	193,573	157,682	42,580	485,456	91,910	971,201	345,195	.....	50,396	294,799	.....
Terminal R.R. Ass'n of St. Louis	26	.....	2,972	2,322,535	263,862	151,429	5,389	717,237	66,536	1,204,453	1,118,082	129,669	255,738	992,013	73,025
Texas Mexican	162	170,122	57,839	247,549	75,845	2,787	4,770	110,163	13,714	207,279	40,270	.....	15,849	24,421	‡638
Texas Midland	125	360,515	106,567	509,914	123,949	89,950	15,506	166,822	35,723	431,950	77,964	.....	15,162	62,802	124,584
Tonopah & Goldfield	109	662,616	192,233	910,018	90,756	116,931	23,204	388,459	62,233	681,583	228,435	585	45,850	183,170	‡206,907
Tonopah & Tidewater	181	337,925	99,692	458,278	76,670	41,861	26,785	138,594	15,486	299,396	158,882	.....	21,323	137,559	7,172
Union R.R. Co. of Baltimore	9	916,734	217,751	1,157,114	81,606	.....	3,024	59,105	18,987	162,722	994,392	.....	53,584	940,808	‡96,240
Union R.R. Co. of Pittsburgh	31	.....	.....	2,882,325	365,340	515,398	1,210	1,043,872	37,750	1,963,570	918,755	17,697	27,650	908,802	386,756
Washington Co.	139	281,401	162,254	483,733	123,912	58,655	3,902	167,625	12,491	366,585	117,148	.....	2,735	114,413	‡2,723
Western Railway of Alabama	133	565,827	416,343	1,073,099	206,716	187,085	52,310	315,468	50,378	811,957	261,142	2,103*	53,437	205,602	‡8,484
Wichita Valley	174	408,356	218,904	656,299	110,211	36,881	4,437	212,164	22,822	386,515	269,784	.....	16,453	253,331	40,063
Wisconsin Central	975	5,509,440	1,509,110	7,494,355	850,366	1,019,772	282,346	2,705,385	236,638	5,094,507	2,399,848	5,112	350,627	2,054,333	185,847
Wyoming & North Western	148	249,445	88,038	354,667	51,837	21,152	3,551	129,285	4,374	210,199	144,468	.....	21,083	123,385	18,481

(a) Credit. *Deficit. †Loss. ‡Decrease.

The Condition of the Cotton Crop.

The crop reporting board of the department of agriculture estimates, from the reports of the correspondents and agents of the bureau, that the average condition of the cotton crop on August 25 was 63.7 per cent. of a normal, as compared with 71.9 on July 25, 1909; 76.1 on August 25, 1908; 72.7 on August 25, 1907, and 73.6 the average of the past ten years on August 25. Comparisons of conditions by states follow:

States.	Aug. 25, 1909.	July 25, 1909.	Aug. 25, 1908.	Aug. 25, 1907.	10-yr. av.
Virginia	73	71	87	77	81
North Carolina	73	71	80	78	76
South Carolina	74	77	76	83	75
Georgia	73	78	77	81	76
Florida	75	84	80	80	78
Alabama	66	68	77	73	73
Mississippi	61	64	79	72	77
Louisiana	48	58	63	69	74
Texas	59	70	75	67	69
Arkansas	60	76	83	65	74
Tennessee	75	80	88	78	81
Missouri	80	85	90	75	81
Oklahoma	56	79	70	71	75
United States	63.7	71.9	76.1	72.7	73.6

New Bills of Lading in Canada.

The forms of new bills of lading approved by the board of railway commissioners for Canada under order of July 15, 1908, became effective on October 1, and are required to be used exclusively by the Canadian railways after that date. The Canadian Freight Association is circulating sample copies of the new forms among the railways in Canada, together with a copy of a proposed circular to freight agents and a copy of a notice mailed to shippers describing the new forms and explaining the regulations which will govern their use. For "straight" consignments the bill of lading, shipping order and memorandum acknowledgment are to be printed on white paper, while for "order" shipments the bill of lading will be printed on yellow paper and the shipping order and memorandum acknowledgment will be printed on blue paper. All bills of lading must conform literally to the wording of the new forms and must be identical with these forms as to appearance, size and character of type, arrangement of printed matter, and size (8½ in. wide and 11 in. long) and color of paper. All bills of lading are to be signed by the shipper, or by his representative, as well as by the agent of the carrier. The employment of the shipping order and memorandum acknowledgment renders unnecessary any different form of shipping receipt. The new bills of lading do not supersede the existing through ocean bills of lading or the live stock contract forms.

Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 52, covering car balance and performance for March, 1909, says:

"During the month there was a further reduction in surplus equipment, the daily average being 295,981, or 13.99 per cent. of the total equipment. The shop cars increased from 7.04 per cent. in February to 7.26 per cent. in March. Eliminating the surplus cars and the excess bad order cars from the performance averages, we show the following results:

	Average miles per day. Inc. surp.	Exc. surp.	Average ton-miles per car per day. Inc. surp.	Exc. surp.	Average earnings per car per day. Inc. surp.	Exc. surp.
	cars.	cars.	cars.	cars.	cars.	cars.
December, 1907	21.9	23.9	289	316	$1.98	$2.17
January, 1908.	20.8	24.9	277	325	1.81	2.17
February, 1908	19.7	23.8	271	328	1.82	2.20
March, 1908...	21.2	25.5	290	348	1.95	2.34
April, 1908...	19.6	24.5	258	324	1.83	2.29
May, 1908....	19.3	24.8	254	329	1.72	2.22
June, 1908....	19.6	24.7	276	347	1.88	2.37
July, 1908....	20.0	24.8	275	342	1.84	2.26
August, 1908..	20.8	25.1	292	354	1.98	2.40
Sept., 1908....	22.0	25.2	320	367	2.24	2.57
October, 1908..	23.8	25.9	346	376	2.33	2.54
November, 1908	23.5	25.8	341	375	2.32	2.55
December, 1908	22.3	25.2	332	376	2.16	2.45
January, 1909.	20.9	25.3	293	354	1.98	2.39
February, 1909.	21.7	25.9	306	365	2.04	2.43
March, 1909..	22.7	27.2	330	393	2.19	2.61

"The averages noted above for the active equipment are the highest of which we have record so far as miles per day and

CAR BALANCE AND PERFORMANCE IN MARCH, 1909.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Okla., Ind. T., Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	72,880	650,506	278,519	130,507	174,286	368,888	16,794	132,788	24,878	116,041	101,683	2,067,770
Average number system cars on line	54,557	455,120	210,298	91,772	123,870	288,221	6,760	95,163	14,175	63,581	77,988	1,481,505
Railroad-owned cars: Av. foreign on line	29,392	163,062	64,546	32,714	40,498	81,589	11,776	38,059	19,287	42,007	16,197	539,127
Total cars on line	83,949	618,182	274,844	124,486	164,368	369,810	18,536	133,222	33,462	105,588	94,185	2,020,632
Excess	11,069	.....	.....	.....	.....	922	1,742	434	8,584	.....	.....	.....
Per cent. cars on line to total owned:												
Home			76	70	71	78	40	72	57	55	77	72
Foreign	75	70	23	25	23	22	70	28	78	36	16	26
All railroads	40	25	99	95	94	100	110	100	135	91	93	98
Private cars on line	115	95	11,100	3,601	5,954	13,370	1,219	6,143	2,201	7,482	3,115	95,377
Total, all cars on line	2,941	38,251	285,944	128,087	170,322	383,180	19,755	139,365	35,663	113,070	97,300	2,116,009
Per cent. of cars in shop	86,890	658,433	5.93	8.66	8.37	6.66	5.06	13.98	5.32	6.08	8.58	7.26
No of freight engines owned	5.80	6.76	9,829	3,783	2,221	6,326	440	2,522	660	2,342	2,112	33,899
Av. cars on line per freight engine owned	1,110	9,829	3,783	2,221	2,554	67	45	55	54	48	46	62
Total freight-car mileage	78	67	76	58	67	61	22,774,923	86,326,238	28,580,580	106,703,851	81,986,975	1,486,190,363
Average miles per car per day	44,742,452	476,286,414	171,736,481	84,233,329	114,368,102	268,451,018	37.2	20.9	25.9	30.4	27.4	22.7
Per cent. loaded car mileage	16.6	23.4	19.4	21.2	21.7	22.7	76.7	69.6	65.7	70.2	78.4	69.0
Ton-miles of freight, inc. Co. freight	72.7	65.8	65.4	68.4	70.1	72.2	349,312,186	1,196,511,203	327,808,589	1,483,118,090	1,177,210,841	19,809,676,665
Average ton-miles, including Co. freight:	479,947,002	7,233,687,176	2,422,012,504	1,148,823,063	1,569,263,308	2,421,982,703						
Per car-mile	10.7	15.2	14.9	13.6	14.0	13.8	15.9	13.9	11.5	13.9	14.3	14.3
Per loaded car-mile	14.8	23.1	22.8	19.9	18.2	19.6	20.7	20.1	17.5	19.8	18.3	20.9
Per car per day	178	355	301	289	304	321	607	290	297	423	399	330
Gross freight earnings	$5,495,338	$43,198,612	$14,119,947	$8,460,215	$10,693,930	$20,332,425	$2,725,120	$10,092,695	$2,790,760	$14,022,560	$7,332,186	$139,263,788
Average daily earnings: Per car owned	$2.43	$2.15	$1.64	$2.09	$2.03	$2.31	$5.23	$2.46	$3.62	$3.90	$2.33	$2.24
Per railroad-owned car on line	2.11	2.26	1.66	2.19	2.15	2.32	4.74	2.45	2.69	4.28	2.51	$2.30
All cars on line	2.04	2.13	1.59	2.13	2.07	2.22	4.45	2.34	2.52	4.00	2.43	$2.19

ton-miles per day are concerned, while the earnings per car are but .06 short of the high average reached in October, 1907. This performance would seem to bear out the prediction that a return to normal conditions will show a marked increase in the efficiency of freight cars. There was practically no change in the balance figures, and the per cent. of loaded mileage was unchanged from the February average of 69.0 per cent.

"The tons per car increased from 20.4 in February to 20.9 in March, due to an increase in the proportion of high class commodities handled, indicated by the reports of surplus box and coal cars."

Revenues and Expenses of Railways.

The following table gives a summary of the monthly reports of railways filed with the Interstate Commerce Commission for May:

Item.	1908 Amount.	1908 Per Mile of line.	1908 Ratio p. ct.	1909 Amount.	1909 Per Mile of line.	1909 Ratio p. ct.
Rail operations:						
Freight revenue	$108,164,241	$529	66	$126,513,779	$606	67
Pass'ger revenue	41,592,532	203	25	46,258,598	221	24
Other transp. rev.	13,295,596	65	8	14,980,859	72	8
Non-trans. revenue	1,726,994	8	1	1,796,401	9	1
Unclassified rev.	15,424	..	..	13,680	..	..
Total oper. revs.	$164,794,785	$805	100	$189,563,318	$908	100
Maint. way & struc	$25,439,146	$124	15	$26,599,079	$127	14
Maint. of equipmt.	18,611,950	91	11	25,065,666	120	13
Traffic expenses	3,590,069	18	2	4,120,943	20	2
Transp. expenses	58,177,823	284	35	60,891,809	292	32
General expenses	4,638,625	23	3	5,146,279	25	3
Unclassified exp.	49,227	..	..	13,561	..	..
Total op. exp.	$110,507,290	$540	67	$121,837,338	$583	64
Net oper. rev.	$54,287,495	$265	32	$67,725,980	$324	36
Outside operations:						
Total revenues	$2,335,979	$11	..	$4,128,751	$20	..
Total expenses	1,860,184	9	..	3,759,059	18	..
Net revenue	$475,795	$2	..	$369.692	$2	..
Total net rev.	$54,763,290	$268	..	$68,095,672	$326	..
Taxes (1/2 an'l amt.)	6,930,332	34	..	6,985,897	33	..
Operating income.	$47,832,958	$234	..	$61,109,775	$293	..
No. of reports	698			729		
Mileage operated	204,630			208,852		

INTERSTATE COMMERCE COMMISSION.

The Interstate Commerce Commission has issued an order to put in effect the agreement between the railways and dealers in yellow pine of the Louisiana, Mississippi and Western Alabama section, commonly known as the Central Yellow Pine Association territory. About $1,500,000, it is estimated, will be paid in reparation on account of excessive freight charges. The compromise agreement made between the railways and dealers is held to be legal by the commission.

STATE COMMISSIONS.

The New York Public Service Commission, Second district, in the case of Horace Inman v. the American Express Company, found in favor of the complainant. The complainant alleged that the express rate between Amsterdam, N. Y., and Raquette Lake of $1.60 per 100 lbs. is excessive. This rate is based on the company's practice of re-billing express matter shipped between those points at Clearwater. The rate is made up of the $1.10 rate between Amsterdam and Clearwater added to a 50 cent rate between Clearwater and Raquette Lake, the latter being the northeastern terminus of the Raquette Lake Railway, which joins the New York Central & Hudson River at Clearwater. This is the only instance where the express company charges a combination rate on re-billed traffic shipped between points on its own routes. The rate in other cases is less than the combination of rates to and from intermediate points. On small packages less than 100 lbs. the combination rate method greatly increases the charge over a rate based on straight billing. The practice of re-billing at Clearwater should be discontinued and through billing at a single rate should be substituted. It is also held that the present charge of $1.60 per 100 lbs. is unreasonable and unjust and should not exceed $1.45 per 100 lbs.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Jackson Smith, a former member of the Isthmian Canal Commission, has been elected vice-president of the Oregon Trunk line.

C. B. Rogers, vice-president and general manager of the Rio Grande, has been elected president and general manager, with office at Kingsville, Tex.

F. S. Pearson has been elected president of the Mexico North Western; E. D. Kenna, vice-president; Walter Gow, vice-president and general counsel, all with offices at New York; Enrique C. Creel, vice-president, and C. T. Carson, auditor, both with offices at Chihuahua, Mex. The Mexico Northwestern has taken over the Chihuahua & Pacific, the Sierra Madre & Pacific and the Rio Grande, Sierra Madre & Pacific.

John F. Stevens has been elected president of the Oregon Trunk Line, being built by the Hill interests from The Dalles, Ore., south to Madras, in central Oregon, 122 miles. Mr. Stevens was born on April 25, 1853, at West Gardiner, Me. He became assistant engineer of the city of Minneapolis, Minn., in 1874, and remained in that position until he began railway work in 1876 in charge of surveys, and later was made chief engineer of the Sabine Pass & Northwestern. He was appointed assistant engineer of the Denver & Rio Grande in 1879 and the following year went to the Chicago, Milwaukee & St. Paul as assistant engineer. From 1882 to 1886 he was division engineer on the Canadian Pacific, leaving that position in 1886 to return to the Chicago, Milwaukee & St. Paul as assistant engineer. The following year he was made principal assistant engineer of the Duluth, South Shore & Atlantic, and in 1889 was appointed assistant engineer of the Spokane Falls & Northern. He resigned in 1890 to go to the Great Northern as principal assistant engineer, becoming assistant chief engineer in 1893 and chief engineer in 1895. In June, 1898, he resigned to go into business as a contractor. The following April he was appointed chief engineer of the Great Northern, becoming also the general manager in June, 1902. He was appointed chief engineer of the Chicago, Rock Island & Pacific in March, 1903, and the following August was elected the fourth vice-president, becoming the second vice-president in April, 1904. He was appointed chief engineer of the Isthmian Canal Commission in July, 1905, and in August, 1907, was elected vice-president in charge of transportation of the New York, New Haven & Hartford, which position he held until his resignation in June of this year.

John F. Stevens.

Operating Officers.

J. M. Mills has been appointed car accountant of the Raleigh & Southport, with office at Raleigh, N. C.

W. H. Linton has been appointed trainmaster of the Joliet division, except Joliet terminals, of the Elgin, Joliet & Eastern, with office at Joliet, Ill., succeeding H. A. Milligan, transferred.

Robert Murray, assistant superintendent of the Chicago, Milwaukee & Gary at Rockford, Ill., has resigned and the office of assistant superintendent is abolished. P. G. Williams, chief

despatcher at Rockford, has been promoted to trainmaster and will assume the duties of the assistant superintendent.

J. W. Doyle, trainmaster of the Chicago & North Western at Council Bluffs, Iowa. has been appointed superintendent of the Pierre, Rapid City & North Western, with office at Pierre, S. Dak.

C. P. Chesebro, general car accountant of the Wabash, with office at St. Louis, Mo., has been granted an extended leave of absence on account of ill health. F. P. Gibbs succeeds Mr. Chesebro as acting general car accountant.

F. S. Yantis, formerly auditor and traffic manager of the Stephenville, North & South Texas at Stephenville, Tex., has been appointed general superintendent of the Dardanelle, Ola & Southern, with office at Dardanelle, Ark.

H. C. Ferris has been appointed general manager of the Mexico North Western and E. Dimick superintendent of the Chihuahua division, both with offices at Chihuahua, Mex. George Rutledge has been appointed superintendent of the El Paso division, with office at Ciudad Juarez, Mex. This company has taken over the Chihuahua & Pacific, the Sierra Madre & Pacific and the Rio Grande, Sierra Madre & Pacific.

A. Buckley, chief despatcher of the Oregon Railroad & Navigation Company at La Grande, Ore., has been appointed an assistant superintendent, with office at La Grande, succeeding J. D. Matheson, transferred. W. Bollons, division engineer of the Southern Pacific Lines in Oregon, has been appointed the superintendent of the Oregon division, with office at Portland, succeeding D. W. Campbell, resigned. C. C. Blood succeeds Mr. Bollons.

J. H. Taylor, superintendent of the Lake district of the Great Northern at Superior, Wis., has been appointed general superintendent of the Central district, with office at Minot, N. Dak., succeeding R. W. Bryan, deceased. F. S. Elliott, superintendent of the Dakota division at Grand Forks, N. Dak., succeeds Mr. Taylor, and F. D. Kelsey, assistant division superintendent at Grand Forks, succeeds Mr. Elliott. Effective September 1 the limits of the Eastern district are extended to include the Dakota division.

Traffic Officers.

V. E. Labbe has been appointed a traveling passenger agent of the Illinois Central, with office at Omaha, Neb.

Joseph Ebert has been appointed a contracting freight agent of the Texas & Pacific, with office at New Orleans, La.

J. E. W. Fields, Jr., has been appointed general freight and passenger agent of the Tellico Railway, with office at Athens, Tenn.

J. M. Symmonds, traveling freight agent of the Texas Midland, has been appointed a commercial agent, with office at Dallas, Tex.

E. S. Manchester has been appointed a traveling freight agent of the New York, Chicago & St. Louis, with office at Buffalo, N. Y.

L. P. Smith, a traveling passenger agent of the St. Louis South-Western, has been transferred from Atlanta, Ga., to Birmingham, Ala.

G. M. Frazer, traveling freight and passenger agent of the Illinois Central at Salt Lake City, Utah, has resigned to go with another company.

Charles C. Merrill has been appointed a general agent, passenger department, of the New York Central Lines, with office at Kansas City, Mo.

Arthur C. Burrows, traveling passenger agent of the Lake Shore & Michigan Southern, has been transfered from Kansas City, Mo., to Denver, Colo.

Harvey E. Jones, Jr., has been appointed an assistant general passenger agent of the Southern Railway in Mississippi, with office at Columbus, Miss.

R. M. Smith has been appointed a general agent, freight department, of the Great Northern, with office at St. Paul, Minn., succeeding G. H. Smitton.

John O. Hamilton has been appointed general freight and passenger agent of the Midland Valley, with office at Muskogee, Okla., succeeding C. B. Hart, resigned.

George P. French, traveling freight agent of the Wabash at Salt Lake City, Utah, has been transferred to Denver, Colo. He will report to R. W. Owens, general agent.

H. V. Gregory has been appointed a commercial freight agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, with office at Louisville, Ky.

Harry Larkin, traveling freight agent of the Seaboard Air Line, has been appointed a commercial agent of the Carolina, Clinchfield & Ohio, with office at Cincinnati, Ohio.

J. W. Brown, tariff clerk in the general freight office of the El Paso & Southwestern, has been appointed a traveling freight and passenger agent, with office at St. Louis, Mo.

J. A. Wells has been appointed a traveling freight agent of the Missouri Pacific, with office at Louisville, Ky., and V. K. Norvert has been appointed a commercial agent, with office at Cleveland, Ohio.

S. T. DeMilt, assistant general agent of the Mallory Line at Galveston, Tex., has been appointed general agent of the International & Great Northern, with office at Galveston, Tex., succeeding I. M. Griffin, promoted.

F. L. Moe has been appointed western freight agent of the National Railways of Mexico, and Gabe Filleul western passenger agent, both with offices at Chicago, succeeding to the duties of T. R. Ryan, general western agent.

Philip J. Brady has been appointed a traveling passenger agent of the Southern Pacific, the Union Pacific, the Oregon Short Line and the Oregon Railroad & Navigation Co., with office at Cincinnati, Ohio, succeeding Thos. C. Hirst, retired.

J. D. Gowin, a traveling freight agent of the Chicago, Rock Island & Gulf, has been transferred from Dallas, Tex., to Fort Worth, succeeding J. G. Thompson, resigned, to go to another company. S. M. Wallace succeeds Mr. Gowin, with office at Dallas.

R. W. Morris, commercial agent of the Seaboard Air Line, has been appointed a traveling freight agent, with office at Birmingham, Ala. W. L. Burroughs succeeds Mr. Morris, with office at Columbia, S. C. R. H. Dozier has been appointed a soliciting freight agent, with office at Tampa, Fla., succeeding E. G. Staley.

T. R. Ryan has been appointed traffic manager of the Mexico North Western and P. A. Hutchins has been appointed general freight and passenger agent, both with offices at Chihuahua, Mex. This company has taken over the Chihuahua & Pacific, the Sierra Madre & Pacific and the Rio Grande, Sierra Madre & Pacific.

Morgan Richards has been appointed a commercial agent of the Southern Railway, with office at Meridian, Miss., reporting to W. A. Turner, general freight agent at Chattanooga, Tenn., regarding traffic to and from the territory west of Meridian, and reporting to J. W. Hunter, division freight agent at Selma, Ala., regarding traffic in Meridian proper. J. D. Coons has been appointed a soliciting agent, with office at Mobile, Ala.

D. L. Meyers, general freight and passenger agent of the Eastern Railway of New Mexico, the Southern Kansas Railway of Texas, the Pecos & Northern Texas and the Pecos River Railroad at Amarillo, Tex., has been appointed an assistant general freight agent of the Atchison, Topeka & Santa Fe, with office at Chicago. J. Brinker, general agent of the Santa Fe at St. Louis, Mo., succeeds Mr. Meyers. B. J. Libbe, commercial agent at Minneapolis, Minn., succeeds Mr. Brinker, and E. L. Jansen succeeds Mr. Libbe.

C. H. Jackson, commercial agent of the Cleveland, Cincinnati, Chicago & St. Louis at Pittsburgh, Pa., has been appointed an assistant general freight agent, with office at Cincinnati, Ohio, in charge of solicitation of freight traffic and any other duties which may be assigned to him from time to time by the general freight agent. J. W. Clark succeeds Mr. Jackson. H. J. Burgee, commercial agent at Kansas City, Mo., has been appointed a division freight agent, with office at Chicago, succeeding C. Tillinghast, assistant general freight agent, transferred. Joseph Rankin, commercial agent at Dallas, Tex., succeeds Mr. Burgee. S. E. Thomas, general agent at Indianapolis, Ind., succeeds Mr. Rankin, and C. R. Lewis, commercial agent at Minneapolis, Minn., succeeds Mr. Thomas. S. A. Townsend succeeds Mr. Lewis. E. L. Porter has been

appointed a traveling freight agent, with office at Jacksonville, Fla.

Engineering and Rolling Stock Officers.

George H. Burgess has been appointed chief engineer of the Quebec, Montreal & Southern, with office at Montreal, Que.

A. C. Olney has been appointed chief engineer of the Tampa Northern, with office at Tampa, Fla., succeeding John Pasco.

J. J. Harrison has been appointed chief engineer of the Missouri, Oklahoma & Gulf, with office at Calvin, Okla., succeeding E. J. Noonan, resigned.

John A. Lee, shop and engine-house foreman of the Western Allegheny at Kaylor, Pa., has been appointed master mechanic, with office at Kaylor, succeeding J. H. Marks.

C. W. Lee has been appointed master mechanic of the Raleigh & Southport, with office at Raleigh, N. C., succeeding George L. Womble. The title of A. E. Guess has been changed from supervisor to roadmaster.

B. H. Bryant has been appointed chief engineer of the Mexico North Western, with office at Chihuahua, Mex. This company has taken over the Chihuahua & Pacific, the Sierra Madre & Pacific and the Rio Grande, Sierra Madre & Pacific.

W. L. Kellogg, superintendent of motive power and car department of the Pere Marquette at Detroit, Mich., has been appointed superintendent of motive power of the Cincinnati, Hamilton & Dayton, with office at Lima, Ohio, and will have charge of the locomotive and car department.

William Boughton, master mechanic of the Pere Marquette at Saginaw, Mich., has been appointed general master mechanic in charge of locomotive and car departments, with office at Detroit, Mich., W. L. Kellogg, superintendent of motive power and car department, having resigned to accept service with another company.

J. H. Phillips, assistant engineer at Hoboken, N. J., in charge of the Susquehanna grade crossing elimination work of the Delaware, Lackawanna & Western, has resigned to go into other business. Mr. Phillips had charge, under the supervision of E. I. Contine, division engineer, of boring the second Bergen Hill, N. J., tunnel.

Schuyler Hazard, resident engineer of the New York Contracting Co., in charge of work on the Pennsylvania terminal station, New York City, has resigned to become general manager and chief engineer of the Orleans County Quarry Co., Albion, N. Y. Mr. Hazard is a member of the American Society of Civil Engineers and was formerly a division engineer on the New York Central & Hudson River and later roadway engineer on the Southern Railway.

Purchasing Officers.

W. P. Plummer has been appointed purchasing agent of the Mexico North Western, with office at New York. This company has taken over the Chihuahua & Pacific, the Sierra Madre & Pacific and the Rio, Grande, Sierra Madre & Pacific.

OBITUARY.

W. F. Carter, general agent, passenger department, New York Central Lines at Toledo, Ohio, died September 2 of peritonitis at his home in Toledo after a short illness.

George W. Dickinson, formerly president and general manager of the Alaska Central, died at Seattle, Wash., on September 2. Mr. Dickinson was born April 21, 1853, and began railway work in 1866 as messenger and later held different positions until 1869 in the freight office of the Atlantic & Great Western, now a part of the Erie, at Cleveland, Ohio. From 1870 to 1887 he was successively ticket agent, agent, despatcher and assistant superintendent of the Union Pacific, holding the last position at Evanston, Wyo. In 1887 he became division superintendent of the Montana Union Railway, now a part of the Northern Pacific, at Butte, Mont., and in February, 1899, was appointed superintendent of the Northern Pacific. In September of the latter year he was appointed assistant general superintendent, and from October, 1895, to September, 1896, he was general manager for the western receivers. Subsequently until January, 1905, he was president and general manager of the Alaska Central. He was also for a number of years general manager of the Seattle Electric Railway.

Railroad Construction.

New Incorporations, Surveys, Etc.

BALTIMORE & EASTERN.—Plans are said to be made to build from a point in Kent county, Md., south via Chestertown, Centerville and Easton to Cambridge ferry, about 60 miles. The incorporators include: W. H. Fehsenfeld, D. N. Fulton, E. A. Davis, E. T. Jones and A. H. McDonald, all of Baltimore.

BANGOR & AROOSTOOK.—The extension from Grand Isle, Me., to Van Buren, 15 miles, is expected to be ready for operation about October 1. Three other extensions, aggregating 71 miles, are expected to be opened the following month. (July 23, p. 167.)

CANADIAN PACIFIC.—According to press reports the improvements on the main line between Field, B. C., and Hector, including the tunnel, have been finished and the line was opened for traffic on August 24. McDonnell & Gzowski, of Vancouver, B. C., were the contractors. (Aug. 20, p. 339.)

CHARLESTON, MONTGOMERY & EASTERN.—Preliminary surveys have been made from Charleston, W. Va., southeast via Montgomery, Cannelton and Kanawha Falls to Ganley bridge, 38 miles. C. K. McKermott, engineer in charge, Charleston.

CHESAPEAKE & OHIO.—The report of this company for the year ended June 30, 1909, shows that work was finished during the year as follows: Second track, between Oriana, Va., and Lee Hall, 4.9 miles; second track and grade revision on the Richmond division, between Lightfoot, Va., and Diascund, 7.1 miles; second track, between Jerry's Run, Va., and Lewis tunnel, 1.1 miles; on the Hinton division, between Gauley, W. Va., and Kanawha Falls, 3.2 miles; on the Huntington division, between St. Albans, W. Va., and Lewis, 0.9 mile; on the Cincinnati division, between Maysville, Ky., and Lawrence creek, 4.6 miles, all of which is now in operation. During the year there was added 12.1 miles to the Coal River Railway and 8.6 miles to the Raleigh & Southwestern Railway.

Work is now under way on a change of line and grade, and the double-tracking between Lewis, W. Va., and Barboursville. This work is expected to be finished by November of this year. The construction of a second track on each side of the Gladstone, Va., yard, nine miles, is expected to be finished about the same time. (March 19, p. 652.)

DALLAS INTERURBAN.—Plans are said to be made to build from Dallas, Tex., east to Terrell, thence northeast to Greenville, about 73 miles. The work will include a double-track street railway bridge, 500 ft. long, also two steel spans, each 250 ft. long. J. M. Carter, manager, Dallas.

DENVER, NORTHWESTERN & PACIFIC.—According to press reports a contract has recently been let to the Hall Construction Co., of Denver, Colo., for building a spur from the main line in Gilpin county, Colo., south via Central City to Blackhawk, about 10 miles.

EL PASO & SOUTHWESTERN.—According to press reports this company has filed an application in New Mexico to increase its capital stock from $18,000,000 to $25,000,000. It is understood that the company is planning to build an extension west to the Pacific coast.

ENID & CENTRAL OKLAHOMA TRACTION.—An officer writes that the present plans call for starting work about October 1. The projected route is from Enid, Okla., south via Waukomis, Bison, Hennessey, Okarchee, Dover, Kingfisher and Darlington to El Reno, about 65 miles. W. S. Whittinghill, president; H. S. Moreland, chief engineer, of Enid. (Aug. 13, p. 296.)

GEORGIA, FLORIDA & ALABAMA.—An extension of this road from Cuthbert, Ga., north to Benevolence, 10 miles, has been opened for business.

GENEVA & AUBURN (ELECTRIC).—The New York Public Service Commission, Second district, has authorized the Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction to give a mortgage for $2,500,000; the proceeds, amounting to $100,000, are to be used for buying property, building extensions and making improvements. Work already planned includes an

extension from Seneca Falls, N. Y., east across Cayuga lake to Auburn. (June 18, p. 1329.)

Geneva, Waterloo, Seneca Falls & Auburn Traction.—See Geneva & Auburn.

Goose Lake & Southern.—See Southern Pacific.

Great Northern.—An officer writes that bids are wanted for revision work on the present line and putting in second track over the Rocky mountains on the section from Summit, Mont., west to Java, 14 miles.

Gulf, Colorado & Santa Fe.—An officer is quoted as saying that a new line is to be built from the San Angelo branch, between Lampasas, Tex., and Brownwood, west to the western boundary of San Saba county, 50 miles.

An officer writes that location surveys are now being made for an extension from San Angelo, Tex., northwest to Sterling City, about 40 miles.

Idaho & Washington Northern.—Passenger service on the extension north from Newport, Wash., has been extended to Usk, 20 miles from Newport.

Kankakee & Urban Traction.—An officer writes that the proposed route is from Kankakee, Ill., south via Urbana to Charleston, about 125 miles, with a 30-mile branch from Chebanse southwest to Piper City. The work will be easy. The line is to have maximum grades of 1 per cent., with a maximum curvature outside of towns of 5 deg. There will be 1,760 ft. of steel bridges in spans varying from 30 to 100 ft. each. W. J. Brock, president, and W. D. Moore, Jr., chief engineer, Kankakee. (Sept. 3, p. 426.)

Kansas City, Harlem & St. Joseph (Electric).—An officer writes that the company was recently incorporated in Kansas City, Mo., with $530,000 capital and office at Kansas City. The plans call for a line from Kansas City north across the Missouri river, through Clay county to Dearborn, in Platte county, thence to St. Joseph, where connection is to be made with the Union Terminal Railway Co. A branch is to be built from St. Joseph to Tiffany Springs, in all, 53 miles. Edward J. Ward, president and chief engineer, 7 South Jefferson street, Chicago.

Louisville & Nashville.—Plans are said to be under way to double the capacity of the freight terminal yards at Leewood, east of Memphis, Tenn. Ground is said to have been bought adjoining the present yards. The improved yards are to be 400 ft. by about 4,000 ft.

An officer writes that a contract has been given to J. R. McDowell & Co., of Knoxville, Tenn., for building a line from Straight Creek, Ky., to Kettle island.

Malheur Valley.—See Oregon Short Line.

Memphis, Paris & Gulf.—An officer writes that preliminary surveys have been made for an extension from the present northern terminus at Murphreesboro, Ark., northeast via Amity to Hot Springs, 57 miles; also for an extension from the southern terminus at Ashdown southwest via Clarksville, Tex., to Greenville, 130 miles. A northern extension is eventually to be continued northeast to Little Rock, thence east to Memphis, Tenn. (Aug. 20, p. 339.)

Mexican Roads.—The Mexican-American Holding Co. is said to be organizing a subsidiary company to carry out the terms of a concession which it holds for building a line from the port of Manzanillo, on the Pacific coast, southeast to Salina Cruz, the terminus of the Tehuantepec National, about 700 miles. The railway company is to have a capital stock of $40,000,000 gold. Joseph Castlelot, a Mexican capitalist, is to be vice-president of the company.

Plans, it is said, are under way to build a line from Monclova, on the International division of the National Railways of Mexico, northwest to a connection at Chihuahua with the Mexican Central, the Kansas City, Mexico & Orient and the Chihuahua & Pacific. Surveys made under the direction of J. M. Reid, chief engineer of the National Railways of Mexico, which indicates that the line will be a government project. Ed. Hartman, a coal operator of the Monclova district, and associates, are said to be back of the project.

New Jersey Roads (Electric).—Rights-of-way are being secured for an electric line to be built from Sewaren, N. J., north about six miles. A. F. Kirstein, S. H. Herman and A. Gues and residents of Rahway are back of the project.

New York, New Haven & Hartford.—An officer writes that work is under way on the removal of nine grade crossings at Boston, Mass. About 10 per cent. of the work is finished and grading for temporary tracks is now under way.

Norfolk & Western.—The report of this company for the year ended June 30, 1909, shows that branches and extensions were finished and under way as follows: Catawba branch has been finished from Salem, Va., to the mines of the Copper-Silica & Glass Co., 9.39 miles. The extension of Sand Lick branch, in West Virginia, up the right fork of Sand Lick, 2.12 miles, has been finished, and the Tug Fork branch was extended above Pageton, W. Va., 3.70 miles, to plant No. 12 of the United States Coal & Coke Co. The Spice Creek branch has been finished and put in operation from Roderfield, W. Va., up Spice creek to the coal properties of the Premier-Pocahontas-Collieries Co., 4.54 miles, and the Poplar creek branch has been finished from a point one mile east of Sands, W. Va., to coal properties of the Majestic Collieries Co., in Pike county, Ky., 2.07 miles. The Town Hill branch has been finished from near Richlands, Va., on the Clinch Valley district, to the coal works of the Clinch Valley Mining Corporation, 1.42 miles. The company has a half interest in the Winston-Salem South Bound, which has already let contracts to build from Winston-Salem, N. C., south, to a connection with the Atlantic Coast Line at or near Wadesboro, about 90 miles. The Big Stony has been extended to the western boundary of Giles county, Va., at a point in Monroe county, W. Va., and is now in operation on 16.65 miles. The Interior & West Virginia has been finished from the terminus of the Big Stony at the Virginia state line to connection with the Virginia & Potts Creek, 17.53 miles, and the Virginia & Potts Creek has been graded from the terminus of the Interior & West Virginia at the Craig county line for 4.20 miles to the iron ore mines near Paint Bank. It is expected to have track laying finished in September. Progress has been made in securing right-of-way for the Guyandot & Tug River and branches. The located main line is 62.27 miles and the branches 36.13 miles. The Clear Fork & Oceana has been located from the mouth of Clear Fork, on Guyandot river, up Clear Fork, 24.63 miles, also for 17.92 miles of branches. Some right-of-way has been secured and some grading has been done. The Barker & Clarks Gap has been located from a point near Low Gap, in Micajah Ridge, to the mouth of Barker creek, 10.76 miles, also on 16.57 miles of branches. Some right-of-way has been secured and some grading has been done. See mention of this company elsewhere in this issue.

Northern Pacific.—According to reports this company is planning to build an independent line from Lewiston, Idaho, west along the south bank of the Snake river to Riparia, Wash.

A contract for grading is said to have been given to A. J. Sullivan for new second track between Billings, Mont., and Laurel.

Northwest Arkansas Electric Interurban.—An officer writes that bids will not be asked for grading or bridge work until bonds have been sold. The projected route is from Bentonville, Ark., southwest to Gentry, thence east to Springdale and north via Rogers, returning to Bentonville, thence north via Pearidge and Neosha, Mo., to Joplin, 103 miles, with a number of branches. The main line is to be equipped with electricity and the branches will be operated with some form of motor unit furnishing its own power. There will be four small bridges, to cost about $100,000. W. Morris, president; P. H. Sackett, chief engineer, Bentonville. (May 7, p. 1008.)

Ocilla Southern.—According to press reports this line has been finished and was put in operation September 1 from Ocilla, Ga., south to Allapaha, 17 miles. (March 19, p. 656.)

Oregon Short Line.—Plans are said to be under way for building an extension of the Malheur Valley from Vail, Ore., northwest to Brogan, on lower Willow creek, 25 miles.

Oregon Trunk Line.—According to press reports, this company has bought the surveys of the Central Oregon, surveyed several years ago from Shaniko, Ore., south, via Madras to Bend, but no construction work was ever carried out. It is

said that the Oregon Trunk will begin work at once from Madras, to which point it is now building in central Oregon, south to Bend, about 50 miles. (Sept. 3, p. 426.)

OTTER ROCK & SILETZ.—Incorporated in Oregon, with $100,000 capital, to build from Newport, Ore., north through Cape Foulweather and Otter Rock to the Siletz river. The incorporators include: E. M. Bradford, R. F. Baker and D. L. Kent.

PENNSYLVANIA.—The work of installing the roadbed, rails and the operating equipment in the first of the four tubes, which is known as tube D, of the tunnel system being constructed in connection with the New York terminal improvements under the East river from the Borough of Manhattan into Queens, was begun recently in Long Island City. Within a month the two inside tubes, B and C, will also be ready for operating equipment. About 75 ft. of concrete work remains to join the two sections of tube B, while tube C, which reaches the surface at the Hunter's Point viaduct, in Long Island City, is finished on all except the last 50 ft. It is expected to join the two uncompleted sections of tube A this fall.

A line is now being built near Fleming Summit, Pa., to be known as the Loop Cut-off, for westbound traffic. It shortens the distance 1.61 miles, and is to have maximum grade of 2.2, compensated, in favor of empty cars. The distance between points of connection is 2.49 miles by the loop and 0.85 miles by the cut-off.

PHILADELPHIA & SUBURBAN ELEVATED.—According to press reports a charter has been asked, to build an elevated line on Twelfth and Thirteenth streets, from Johnson street, in the lower part of Philadelphia, to Wayne Junction, with branches as follows: Via Lehigh avenue to Thirty-third and Dauphin streets; on Lehigh and Kensington avenues to Frankford; on Christian street to Gray's Ferry, in all about 20 miles. The company is to have a capital of $1,000,000. The estimated cost of the line is $15,000,000. F. T. Finch, secretary, and Edward O. Lewis, a former member of the City Council, is cousel for the company.

READING-EUREKA ELECTRIC.—According to press reports a project is under way to build from Eureka, Cal., east to Reading, 110 miles. W. S. Clark and E. E. Skinner, of Humboldt, are said to be interested.

ROCKLAND RAILROAD (ELECTRIC).—Organized to build 41.12 miles in the state of New York and 8.5 miles in New Jersey. Application was recently made to the New York Public Service Commission, Second district, for permission to issue bonds for $2,767,000 and to increase the capital stock from $100,000 to $630,000. B. A. Hegeman, Jr., president, and W. H. Coverdale, chief engineer, 66 Broadway, New York. (July 9, p. 79.)

ROSCOE, SNYDER & PACIFIC.—An officer writes that track laying on the extension from Snyder, Tex., north to Fluvanna, 20 miles, was finished on August 28, and the line is to be opened for operation September 10. (March 26, p. 727.)

SOUTHERN PACIFIC.—According to press reports rights-of-way have been secured through the Goose lake valley for the Goose Lake & Southern, and the line is to be finished through Modoc county within the next nine months. The company was organized to build from Goose Lake, Cal., south to Alturas, from which point there are to be two branches, both continuing in a southwesterly direction to connections with the Southern Pacific at Vina and at Cottonwood, in all 406 miles. (March 19, p. 658.)

According to press reports work is to be started by October on the proposed line from Lordsburg in southern New Mexico north via Gallup and Farmington to Durango, Colo., about 360 miles. The line will traverse large coal fields and timber lands as well as the fruit belt of San Juan county.

UNITED RAILWAYS CO.—An officer is quoted as saying that this company, building from Portland, Ore., west via Hillsboro to Forest Grove, 26 miles, will extend its line west to Tillamook and build a branch south to Yaquina bay.

VERA CRUZ & PACIFIC.—Surveys are said to be made for three branch lines into rich agricultural districts adjacent to the main line, aggregating about 150 miles. Construction work is to be started soon.

Railroad Financial News.

CANADIAN PACIFIC.—See Spokane International.

CENTRAL NEW ENGLAND.—The directors have declared a dividend of 4 per cent. on the outstanding $7,250,000 general mortgage 5 per cent. income bonds dated 1899, of which the New York, New Haven & Hartford owns $6,329,123. This is the first dividend ever paid on these bonds. (Aug. 20, p. 341.)

CHICAGO, AURORA & DE KALB.—William Forkell & Co., Chicago, are offering $200,000 first mortgage 5 per cent. bonds of September 1, 1909-1929, at par. The railway company operates a steam road running from Aurora, Ill., to De Kalb. The proceeds of the bond sale are to be used to electrify the road.

CHICAGO GREAT WESTERN.—Press despatches from Minneapolis report the consummation of the negotiations by which this company buys from the Minneapolis, St. Paul & Sault Ste. Marie the terminal property in Minneapolis, formerly owned by the Wisconsin Central. It includes freight houses and shop buildings and the unexpired leases the Wisconsin Central held with the Great Northern over whose tracks its trains run into Minneapolis.

CHICAGO, PEORIA & ST. LOUIS.—The coupons due September 1, 1909, on the prior lien 4½ per cent. bonds are being paid by the receivers at the Liberty National Bank, New York.

DENVER & RIO GRANDE.—It is understood that the $5,000,000 first and refunding 5 per cent. bonds recently sold to the Deutsche Bank of Berlin, Germany, have been offered to the public and have been over-subscribed.

DENVER, LARAMIE & NORTHWESTERN.—A mortgage securing $3,300,000 bonds has been filed. The company was incorporated in 1906 to build a road from Denver, Colo., to Laramie, Wyo., 450 miles. On August 18 twenty miles of road was put in operation.

DETROIT, TOLEDO & IRONTON.—The coupons due September 1 on the $4,495,000 outstanding Ohio Southern division bonds have not been paid. This is the first default in interest on these bonds since the company went into the hands of receivers in February, 1908.

MARIETTA, COLUMBUS & CLEVELAND.—Joseph T. Blair, receiver, has been discharged and the company has resumed possession. The property was put in the hands of a receiver in July, 1908. The road runs from Marietta, Ohio, to Palos, 45 miles.

NEW YORK CITY RAILWAY.—On application of William W. Ladd, receiver of this company, the Metropolitan Securities Co. has been put in the hands of Sidney Smith as receiver. Some time ago a judgment for $5,271,582 was secured against the Metropolitan Securities Co. in favor of the New York City Railway and this judgment was affirmed in February, 1909, by the United States Circuit Court of Appeals. The Interborough-Metropolitan has issued a statement in which it says that in no way will it be affected by this receivership action since the Metropolitan Securities Co. is simply a holding company for the stock of the New York City Railway and the Interborough-Metropolitan is a stockholder in the Metropolitan Securities Co.

NEW YORK, NEW HAVEN & HARTFORD.—See Central New England.

SPOKANE INTERNATIONAL.—The company has sold and the New York Stock Exchange has listed $4,200,000 first mortgage 5 per cent. bonds of 1905-1955. The bonds were issued to pay for terminal and station property and for construction and equipment. The Canadian Pacific advanced one-eighth of the construction cost and has an option on 52 per cent. of the stock. The C. P. R. also has a traffic agreement with the Spokane International.

WESTERN MARYLAND.—Over 90 per cent. of the stock has been deposited with the Equitable Trust Co. and the first instalment of the assessment has been paid on this amount. (Aug. 6. p. 260.)

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Illinois Tunnel Co., Chicago, is now receiving bids on 50 electric locomotives.

The Indiana Northern has ordered one locomotive from the Baldwin Locomotive Works.

The Norfolk & Western has ordered six Pacific locomotives from the American Locomotive Co.

The Delaware & Hudson is in the market for 10 or 12 Mallet compounds. The company is trying out a sample engine.

The Georgia Railroad has ordered two ten-wheel locomotives from the Baldwin Locomotive Works for January delivery.

The Northern Pacific has ordered 11 Mallet compounds from the Baldwin Locomotive Works and 55 locomotives from the American Locomotive Co.

The Illinois Central has ordered from the Baldwin Locomotive Works 13 locomotives, in addition to the 10 mentioned in the *Railroad Age Gazette* of August 27.

The Chicago, Burlington & Quincy has ordered 10 Mallet compounds from the Baldwin Locomotive Works in addition to the five mentioned in the *Railroad Age Gazette* of August 20.

The Baltimore & Ohio has ordered 34 consolidation locomotives from the American Locomotive Co. and 26 Atlantic engines from the Baldwin Locomotive Works. This equipment was mentioned in the *Railroad Age Gazette* of August 20.

CAR BUILDING.

The Seaboard Air Line is in the market for 1,000 box cars, 25 stock cars and 40 automobile cars.

The Lake Superior & Ishpeming is in the market for fifty 40-ton flat cars, to be 43 ft. long over all.

The Atchison, Topeka & Santa Fe has ordered 1,000 refrigerator cars from the American Car & Foundry Co.

The Helena Gas Co., Helena, Ark., is said to be asking prices on gasolene motor cars for street railway and interurban use. This is not yet confirmed.

The Northern Pacific is building at its South Tacoma shops 450 box cars and 250 forty-ton automobile cars. It will build 100 cabooses and 800 thirty-five-ton flat cars.

The Chicago, Burlington & Quincy has ordered 1,000 stock cars from the Mt. Vernon Car Manufacturing Co. These are the cars mentioned in the *Railroad Age Gazette* of August 6.

The New Orleans & Northeastern has ordered 100 box cars and 100 gondolas from the American Car & Foundry Co. This equipment was mentioned in the *Railroad Age Gazette* of September 3.

The Baltimore & Ohio has ordered 500 ventilated box cars from the Ralston Steel Car Co. and 500 refrigerator cars from the Whipple Car Co. These cars were mentioned in the *Railroad Age Gazette* of August 20.

The Gilmore & Pittsburgh, Pittsburgh, Pa., is in the market for 100, general use, 100,000-lb. capacity gondola cars and 100 80,000-lb. capacity box cars. Specifications are now in the hands of car companies and bids are being taken.

IRON AND STEEL.

The Lake Shore & Michigan Southern has ordered 5,000 tons of rails.

The Missouri Pacific is in the market for 40,000 tons of rails for 1910.

The National Railways of Mexico are in the market for 65-lb. rails for 16 miles of road.

The Michigan Central has ordered 100 tons of steel sheet piling for cofferdam work in Canada.

The Chicago, Milwaukee & St. Paul has ordered 1,500 tons of bridge steel from the Riter-Conley Mfg. Co.

The Western Pacific has ordered from the McClintic-Marshall Construction Co. 150 tons of structural steel for a small bridge.

The Wheeling & Lake Erie has ordered 1,800 tons of structural steel for its new shops at Brewster, Ohio, from the American Bridge Co.

The Tientsin-Pukow Railway is asking bids up to September 14 on four spans of 100-ft. deck girders and 10 spans of 200-ft. through girders.

The Atchison, Topeka & Santa Fe has increased the order for rails mentioned in the *Railroad Age Gazette* last week. The addition is for 12,000 tons and goes to the Illinois Steel Co.

The Southern Railway, mentioned in the *Railroad Age Gazette* of September 3 as having ordered 12,000 tons of rails, has placed this order, which is for 85-lb. section A. S. C. E. rails, with the Pennsylvania Steel Co., and has ordered also 28,000 tons of 85-lb. section A. S. C. E. rails from the Tennessee Coal & Iron Co.

General Conditions in Steel.—It is estimated that several western roads are in the market for a total of something over 100,000 tons of rails. Orders for about 400,000 tons were placed during August, making the total contracts since January 1 about 1,700,000 tons. So far this year, about 3,000,000 tons of finished steel have been ordered for railway use. Sales of steel making iron have been heavy recently. They were mostly in small lots, indicating that buying is general, and there are many inquiries in the market.

RAILROAD STRUCTURES.

Amarillo, Tex.—An officer of the Eastern Railway of New Mexico writes that the company has authorized the building of a large freight station and warehouse, also of a combined passenger station and Harvey eating house. The latter building, it is estimated, will cost $83,800. Work on the foundations of the warehouse is already under way and both buildings are expected to be ready for occupancy early in 1910.

Bellingham, Wash.—Work is to be started at once, it is said, by the Northern Pacific on a large freight warehouse and additional team tracks.

Billings, Mont.—Plans are said to be under way for enlarging the Northern Pacific freight station at Billings, Mont.

Booneville, Ark.—The Chicago, Rock Island & Pacific is building a $15,000 hotel and will build later a roundhouse, coal chute and water tank.

Corvallis, Ore.—The Southern Pacific, it is said, has under consideration the question of putting up a passenger station at Corvallis, to cost $20,000.

Everett, Wash.—The Great Northern has given contracts to Grant & Smith for putting up viaducts over Hewitt and Bond streets in Everett.

Godley, Tex.—See Pendleton.

Havelock, Neb.—It is reported that work has been begun by the Chicago, Burlington & Quincy on new shops which will cover 16 acres and cost $1,500,000.

Houston, Tex.—The North Texas Traction Co., it is reported, will build a $10,000 passenger station.

Missoula, Mont.—Bids were asked for up to September 10 by the county clerk at Missoula, Mont., for putting up a combination bridge over the Missoula river near Westfall Spur, on the Coeur d'Alene branch of the Northern Pacific, to consist of two 200-ft. spans. Bids were also asked for a bridge over the St. Regis river near Buford.

NEW YORK.—One of the two car barns of the Union Railway at 175th street and Boston road and about 40 street cars were destroyed by fire September 1.

PENDLETON, TEX.—The Railroad Commission of Texas is said to have approved plans for new stations at Pendleton and Godley for the Santa Fe lines.

ROCK ISLAND, ILL.—The Chicago, Rock Island & Pacific is receiving bids on a two-story, brick and wood commissary building and a one-story, brick and wood laundry.

SAN ANGELO, TEX.—Plans are said to be under way for putting up a 30 or 40-stall roundhouse at San Angelo for the Gulf, Colorado & Santa Fe. It is thought that repair shops and new yards may be added when the improvements are made.

SEATTLE, WASH.—Bids are wanted September 15 at 632 Central building for putting up a passenger station for the Harriman lines at Seattle. The building is to be three stories high, 147 ft. x 187 ft., of reinforced concrete, faced with brick.

VALLEJO, CAL.—According to press reports the San Francisco, Vallejo & Napa Valley will begin work soon on a passenger station at Vallejo, to cost about $20,000.

VANCOUVER, B. C.—The Great Northern is said to have submitted a proposition to the Vancouver City Council for terminal facilities and freight buildings along the water front, to cost about $1,500,000.

SIGNALING.

The Rock Island has just completed the installation of automatic block signals on the Missouri division (single track) between Culver, Iowa, and Eldon, 81.6 miles. There are 96 signals in all. All signals are three-position and give indications in the upper right-hand quadrant. With the exception of five semi-automatic home interlocking signals, which are of the top post type made by the General Electric Co., all signals are style "S," made by the Union Switch & Signal Co. All hand-throw switches remote from signals are equipped with switch indicators, two for each switch in the majority of cases, one to announce westward and one eastward trains. There are 39 such switches. All wires from pole line to apparatus are in cables from the cross arm to a cable post or to a conduit in the top of the signal mechanism case. Cable posts are of 3-in. iron pipe mounted on concrete foundation and carry a relay box or switch indicators if circumstances require. Where signals are on the same side of the track as the pole line, an iron relay box is bolted to the mechanism case; where opposite to the pole line, a relay box is mounted on the cable post. All relays are of the Union Switch & Signal Co.'s type "9c." Signals are placed opposite each other 120 ft. ahead of each outermost switch at stations. All work was done by the Rock Island signal department.

FOREIGN RAILWAY NOTES.

The Chilian government is said to have decided to electrify 720 miles of railway, beginning with 115 miles as an experiment.

The Paulista Railway & Navigation Co., Brazil, has had plans approved for building a line from Pederneiras to Bauru, about 24 miles.

A concession has been given to Julio H. Cardon for a 3-ft. 6-in. gage electric railway from Pabahoyo, Ecuador, to Balzapamba, with further permission to extend to Guaranda. The cost is estimated at $1,400,000, and all the material for building, operating and maintaining the line is to be admitted free of duty.

The Turkish Ministry of Commerce and Public Works, Constantinople, recently asked bids for building and operating a railway from Panderma, via Balikesri, to Soma. The concession will be for 75 years, and during the first years of operation of the main line the concession there will have the right to establish certain branch lines.

Supply Trade News.

The Vulcan Iron Works, Wilkesbarre, Pa., is building a 14-in. x 22-in., standard gage, ten-wheel locomotive for the Whiteville Lumber Co., Goldsboro, N. C.

The Western Electric Co., Chicago, is now in a position to furnish Sunbeam tungsten lamps in voltages between 200 and 250. The lamps are made in four sizes at present: 45, 70, 112 and 180 watts.

John W. Good, formerly in business in Dayton, Ohio, has been elected treasurer of the Lucas Pump Co., Dayton, to fill the vacancy caused by the resignation of R. E. DeWeese, who is at present taking a trip abroad.

A. S. Barrows, formerly chief clerk to the superintendent of motive power of the Delaware, Lackawanna & Western, has taken a position in the railway department of the Pantasote Company, New York, with headquarters at Chicago.

The American Locomotive Co. has ordered 34 cranes for which it was reported in the market in the *Railroad Age Gazette* of September 3. The order was divided as follows: Twenty-four cranes to the Morgan Engineering Co., five Shaw cranes to Manning, Maxwell & Moore, New York, and five Niles cranes to the Niles-Bement-Pond Co., New York.

The Toledo Steel Casting Co., Toledo, Ohio, has succeeded the C. E. Sutton Co., Toledo, manufacturer of punches, shears, forging machines and steel castings. The officers of the company will be: S. D. Carr, president; Thomas F. Meek, vice-president and general manager, and A. A. Barber, secretary and treasurer. Mr. Meek was formerly manager of sales of the Detroit Steel Casting Co., Detroit, Mich. The company contemplates some extensive improvements in the present plant, including the substitution of electric power for the present shafting and the installation of one 20-ton, one 10-ton and two 5-ton cranes. A new building is also being planned, to be 69 ft. wide, 101 ft. long and 26 ft. high under the trusses, with a 50-ft. lean-to along one entire side. A second three-ton converter and another 52-in. cupola are also to be installed shortly, which will bring the capacity of the plant up to 800 tons a month. The company expects to manufacture steel castings of every description, for both railway and industrial work, in sizes up to 20,000 lbs.

Among the recent orders received by the Philadelphia, Pa., plant of the Link-Belt Company, Philadelphia, are the following: New York: Link-Belt adjustable chutes for dock company; bituminous coal handling machinery; open top carrier for contracting company; apron feeder; barrel elevator. New Jersey: V-bucket elevators; apron conveyor; screw conveyor; ore elevators. Export: Flight conveyors; trash elevators. Rhode Island: Coal and coke handling machinery. Delaware: Machinery for handling crushed limestone; conveying machinery for railway company. Florida: Flint-rim sprocket wheels and miscellaneous conveying machinery for handling phosphate rock. Pennsylvania: Link-Belt shallow trough belt conveyors; coal and ashes handling machinery; industrial track system and cars for contracting company; car haulage equipment; retail coal pocket outfit; foundry coke handling machinery; boiler house equipment, including Berquist bin; steel towers for electric light company. Among numerous silent chain orders there are over 500 drives.

TRADE PUBLICATIONS.

Blueprint Papers.—Keuffel & Esser, New York, are distributing a circular describing and giving prices on the blueprint papers made by this company.

"The Autobiography of an Engine."—The Great Northern has on exhibition at the Alaska-Yukon-Pacific exposition the first locomotive to enter the state of Minnesota, the "Wm. Crooks," and the passenger department of the company has published for distribution at the exposition an autobiography of the engine telling the interesting experiences and events in its career of a half century. The "Wm. Crooks" was built by Smith & Jackson, of Paterson, N. J., in 1861. It weighs 5,400 lbs. on the drivers, has cylinders 12-in. x 22-in., and

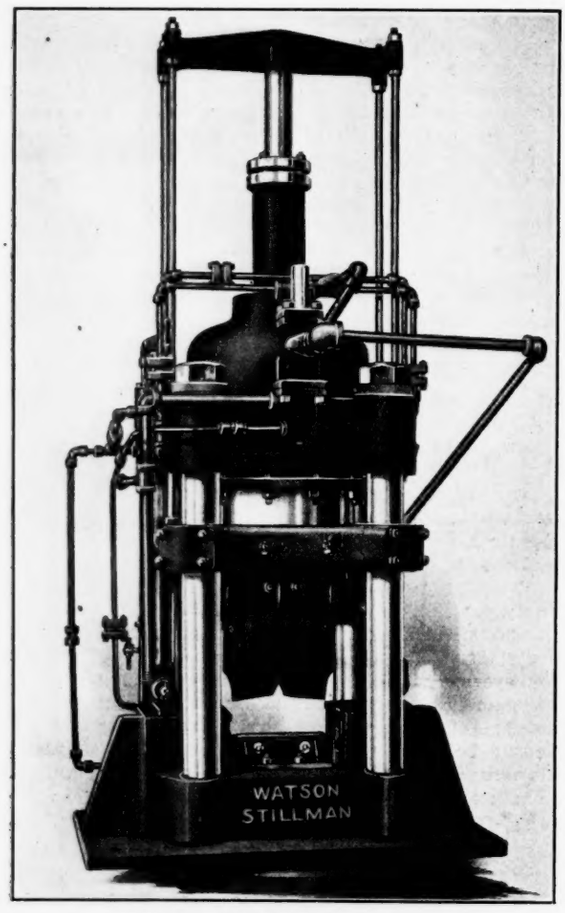
drivers 63 in. in diameter. It has burned wood, peat and coal in various stages of its service. It made the first trip by a steam engine in Minnesota on June 28, 1862, from St. Paul to St. Anthony over the old St. Paul & Pacific. It was put in regular passenger service on July 2 of the same year and continued in more or less active service until about 1900. It stands in the exhibit at Seattle by the side of engine No. 1909, one of the big Mallet compounds, and the contrast presented by them illustrates in an interesting way the development in locomotive building in the last 50 years.

"*South Dakota.*"—The Chicago, Milwaukee & St. Paul has published a booklet to interest settlers in the new country being opened up by the recently completed coast extension. The agricultural resources of South Dakota are described and statistics are given to show the value of its industries; cattle raising, dairying and diversified farming being treated most fully. A map of the state is included as an insert.

An advance notice of passenger train service on the new line is being distributed with this booklet.

Hydraulic Beam Shear.

The hydraulic beam shear illustrated herewith is made for cutting I-beams, channels, T's, flat bars, angle-irons, corrugated channels, Z-bars and other structural shapes. It may also be used to cut round and similar sections in emergencies, when the regular machines for that purpose are in use; by removing the cutting mechanism it is

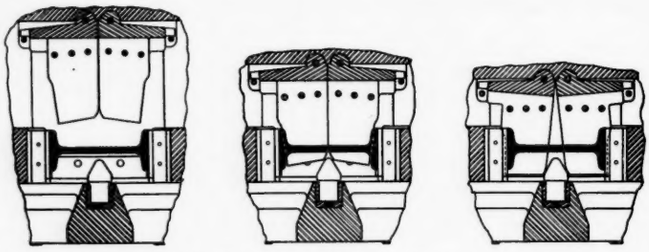


Hydraulic Beam Shear.

readily converted into a powerful hydraulic press for general work.

A simple foot pressure and the manipulation of a hand lever enables an inexperienced operator, it is claimed, to cut structural sections as fast as they can be brought into position. One setting and operation of the machine makes the entire cut, and makes it quick. There is no lost time, as where the cut is made by a series of chops, or as when half is cut and the beam must be turned over and reset before the other half can be cut.

The shear is made in two sizes to take beams and similar sections having longest dimensions of 15 in. and 24 in., respectively. Both sizes are made for an operating pressure of 1,500 lbs. per square inch in the operating cylinder, but the machine can be furnished with cylinders of suitable size for any pressure from 1,000 to 3,000 lbs. instead. The steel frame and cylinders are compact, and the smallness of the moving parts effects a big power saving. The beam, as shown in the drawing, is supported from underneath and at the sides by double stationary knives which conform to its shape and which form a slot into which the upper knives descend. During the cutting operation the lower knives are supported by the lower platen, while those at the sides of the beam are wedged into a position which gives them the solid backing of the machine frame. As the upper knives descend they pass first through the web of the beam and into the slot between the lower knives. As they continue to descend they are parted by the dividing post, and swinging outward, pass through the flanges. It is evident that all parts of the cut are therefore made directly against solid backing and through a



Method of Cutting I-Beam.

practically equal thickness of metal at all points. This added horizontal movement of the upper knives through the flanges, and the firm support of the beam on all sides, does away with the tendency toward distortion. It not only gives a clean shear, impossible with any solid knife that travels through the flanges vertically, but results in a material saving of power.

The gripping and releasing of the beam before and after cutting are entirely automatic, these operations being controlled by the operation by a hand lever of two auxiliary cylinders.

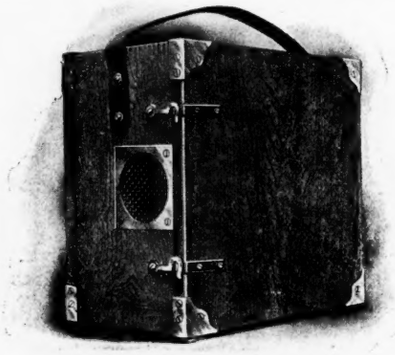
The set of blades shown in the illustration above are of the standard type for cutting I-beams, and may be used for cutting angles, channels and Z-bars of similar proportions. Different sets are made for different sizes of beams. Any set of cutting knives may be removed and replaced in five minutes by those for another size section.

The machine is made by the Watson-Stillman Co., New York.

Composite Telephones.

The Cleveland, Akron & Columbus recently installed a composite telephone circuit on its lines from Akron, Ohio, to Columbus, 130 miles. The line is constructed of No. 9 copper, and has three intermediate telegraph offices between the terminal telephones. There are also three intermediate telephone stations connected to the line.

In connection with this service, the company has equipped a wrecking train with a portable composite telephone, which may be



Portable Composite Telephone.

connected to the line at any point along the road, thus enabling them to obtain direct connection with headquarters at all times. In addition to this, an extra portable composite telephone is kept at the division headquarters to be used on inspection trips or in cases of emergency.

Western Electric Co., Chicago, No. 1312-A composite telephones are used in the stations, and a No. 1314-A portable set is used on the wrecking train. The latter is shown in the illustration.

The above system enables additional service to be obtained at a small cost, as an existing telegraph wire may be used for this service without interfering with the operation of the telegraph service.